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DISPENSARY IDEALS:

WITH A PLAN FOR DISPENSARY REFORM BASED UPON THE ADOPTION OF THE PRINCIPLE OF RESTRICTED NUMBERS.

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I wish to propose a plan for the regulation of dispensary work in New York city, based upon the principle of the limitation of attendance in proportion to facilities for adequate treatment. I believe that the essential features of this plan might be adopted with advantage in Philadelphia, in London, or in any large centre of population and of poverty in England or in the United States, where the prevailing conditions in dispensary work are similar to those in New York.

I shall endeavor to show: (1) That certain evils are bound up with dispensary work as it is now commonly conducted. (2) That in the opinion of the New York State Board of Charities the carefully devised dispensary law of that State has already accomplished almost all that can be expected of it in checking dispensary abuse; and that notwithstanding this, the evil of overcrowding and all of the objectionable practices associated with it, are not notably diminished. (3) That the cure, or at least the effective treatment, of disease, especially the successful treatment of many so-called functional disorders (even at the cost of following patients to their homes for the study of their needs), is the proper aim of dispensary work; and that the ideal of really effective dispensary work imposes upon

dispensaries obligations not generally recognized. (4) That the existing district nursing organizations in New York City deal with an entirely different class of patients from those that ask for dispensary relief. (5) That while a few New York dispensaries are now doing district work, this work is designed chiefly for the relief in their homes of patients who are too sick to come to the dispensary, and, except in isolated instances, is innocent of any intention of checking the development of disease by the promotion of better habits of living. (6) That in New York city the most advanced dispensary work is the work of certain tuberculosis clinics which have undertaken to carry their treatment and teaching into the homes of patients, and which have thus indicated their acceptance of the ideal of effective dispensary work. (7) That many dispensary physicians recognize the need of a reformation in the methods of dispensary treatment, and advocate the extension of the work of the dispensary into the home, wherever it appears necessary to strike at the causes of disease by methods more drastic than the use of drugs.

I purpose, furthermore, to inquire whether it is feasible for a large city like New York, with its multitude of dispensary patients, to adopt the higher dispensary ideals; and to ask by what means, if any, dispensaries can be persuaded to accept these ideals.

I hold that in dispensary work, no less than in hospital work, there are certain standards of method and achievement, to fall below which is to fail. While hospitals, as evidence of their efficiency, present figures representing the large percentage of their patients who are discharged as "cured," a different statistical method is followed in the out-patient department; here the subject of boast is commonly mere growth in attendance, and no attempt whatever is made to judge the work of the department by any real standard of efficiency. But the essence of the matter, the very core of the problem, is not how many patients are treated, but how well they are treated, and we must endeavor to discover and to apply methods which make for efficiency, or be content to have our dispensaries stamped as failures.

Dispensary Abuse. The literature of dispensary abuse is voluminous. It shows, in the main, that the advantage offered by freedom of access to dispensaries is seized by persons not dependent on charitable aid; that partly in consequence of this, and partly because of the efforts of each dispensary to build up a large clientele, dispensaries are overcrowded; that the quality of the work done in dispensaries is low and that it does not tend to improve. Among recent publications on the subject, distinguished either by originality in form or by fulness or novelty of content, I shall briefly allude to two.

In 1903 the Hospital Association of Philadelphia appointed a Committee on Dispensaries and Dispensary Practice, for the purpose of examining into the conditions of dispensary work in Phila-

delphia. (A similar committee, appointed in New York or London, would have found analogous conditions to deal with.) This committee, for the purpose of its inquiry, issued blanks asking for opinions upon existing evils, and calling for remedies. In response to these inquiries, replies were received from 187 physicians and from the officers of 39 out of 61 of the dispensaries then existing in Philadelphia.

From so many critics a great variety of opinion was naturally elicited; but putting aside, as having little bearing upon the purpose of this article, all peculiar and idiosyncratic views, and omitting also replies dealing merely with minor phases of out-patient practice, dispensary abuse was shown to group itself into three main divisions: (1) Abuse on the part of the patient: the use of dispensaries by patients able to pay private physicians. (2) Abuse on the part of the profession: careless and ineffectual treatment. (3) Abuse on the part of the dispensaries: encouragement of large and indiscriminate dispensary services (this in turn fostering the abuse of dispensaries by patients and physicians).

In the second paper to which I shall refer, Richard C. Cabot, proposing the improvement and extension of treatment in out-patient departments, thus sums up the abuses which limit the therapeutic usefulness of dispensaries: "The two great abuses are—first, hurry and consequent makeshift; and second, wholesale drugging," both of which, let me say in passing, are direct products of that encouragement by dispensaries of large and indiscriminate services, which began in London more than sixty years ago and which today is quite as common in this country as in the English capital.[1]

A descripiton of the quality of the work done in the out-patient departments of London, which applies literally to the work done in New York, was given by Mr. Timothy Holmes:[2] "As our out-patient departments are now conducted," says Mr. Holmes, "the patients get an average of the medical officer's time, which is reckoned by seconds rather than by minutes; they get a bottle of physic or some lotion or ointment, but there is no possibility of hygienic treatment, no provision for nourishment or stimulants. Now, much of the sickness, being due to intemperance, insufficient clothing, bad habits, bad food, and poverty, is not susceptible of this

[1] "At St. George's, Mr. Babington (Lord Macaulay's uncle) was, in 1829, appointed the first Assistant Surgeon to the hospital; those who had been so called previously having really been assistants to particular surgeons. Now began that lamentable competition which still continues between hospitals in the number of their patients. This number was easily accepted by the public as a test of the activity and usefulness of the hospital; and, as the number of in-patients could not vary very much for the same number of beds, competition could only be carried on by throwing open the doors of the out-patient department wider and disposing of the cases by hundreds an hour. Not only the general public, but the authorities of the Hospital Sunday Fund accept these numbers as evidence of merit and allow the share of the fund allotted to each hospital to be determined by this consideration." Thomas Mackay, "The State and Charity," page 180.

[2] Charity Organization Review, April, 1897

rough-and-ready treatment, but, so far as it is within the reach of treatment at all, must be treated at home. It is obvious that such medical service can not be satisfactory to the poor."

In an effort really to meet the needs of some of the patients applying for relief to the out-patient department of the Massachusetts General Hospital, Dr. Cabot has called to his aid a little band of social workers, and here, as well as in the tuberculosis clinics of New York, is found the promise of a brighter day for the dispensary patient of the future. "Believing that when a hospital or dispensary undertakes the care of a patient it ought really to care for him, and not be content with going through the form of doing it" says Dr. Cabot, "we have tried to fill the gap between good intentions and their fulfillment. To order for one patient a diet which he cannot possibly procure; for the next a vacation, which he is too poor to take; to forbid a third to worry, when the necessary cause of worry remains unchanged; to give to the fourth directions for an out-door life, which you are morally certain he will not carry out; to try to teach a fifth how to modify milk for her baby, when she understands, perhaps, half of what you say and forgets most of that half—this makes a morning's work not very satisfactory in the retrospect to anybody, and hardly more useful than the old-fashioned wholesale drugging."

It is to fill such needs as these, needs which typify the wants of a large proportion of the patients treated in the non-surgical departments of every general dispensary, and the needs of many of the patients admitted for surgical treatment as well—it is to fill such needs as these that Dr. Cabot has put into the field his force of volunteer social workers, who attend to such patients as the out-patient physicians of the Massachusetts General Hospital see fit to send them. The function of the social worker is to see that the directions of the dispensary physicians are carried out in the patient's home life, and to report back to the physicians any data concerning the domestic or economic life of the patient which bear on diagnosis or treatment. The results obtained at the Massachusetts General Hospital in the relatively small number of cases which there receive attention from the social workers stand out in bold relief against the common background of bad methods and worse results.

I shall not here enlarge upon the subject of dispensary abuse. The faults of our dispensaries are obvious, and the indictment against them is only too familiar. Nowhere else in all the wide field of voluntary or state aid for the unfortunate and the afflicted of our great cities is the gap between aim and achievement, between need and means, so wide as in overcrowded out-patient departments, where (in New York State) more than 2, 900,000 consultations, examinations, or "treatments" are given every year, with a net social gain so small that the contemplation of it challenges the student's faith in the so-called philanthropy concerned in this work.

But it is idle to complain of the abuse of dispensaries by patients able to pay, unless effective machinery for the prompt detection of misrepresentation is established; it is useless to pretend to a desire really to meet the needs of the patient, so long as we accept as proper and sufficient the hasty examination and hurried advice which are commonly practised in our dispensaries today; it is futile to scold about carelessness on the part of physicians, so long as we ask the members of a volunteer and unpaid medical staff to deal unaided with overwhelming numbers in a few minutes or hours.

THE NEW YORK LAW. What efforts have already been made to introduce a better dispensary system and to check existing evils?

In 1899, in the State of New York, an attempt was made to stop dispensary abuse on the part of undeserving patients by the enactment of a State law requiring each dispensary to employ a registrar, to whom was assigned the duty of examining all applicants for dispensary treatment, for the purpose of determining their right to free medical relief. Under this law every applicant may be questioned in regard to his ability to pay for medical or surgical advice or treatment; if the registrar is in doubt, the applicant is required to sign a "representation card," stating his name, address, occupation, income, number in family, etc., which card is made the basis of a subsequent investigation. False representation by applicants for dispensary treatment is made a misdemeanor punishable by fine.

Shortly after the passage of this law it was stated by the Chairman of the Committee on Dispensaries of the New York State Board of Charities that the increase in dispensary attendance had been checked. The fact is that immediately after the enactment of the dispensary law, dispensary attendance actually increased, but at a rate less rapid than that of the growth of population. In 1906, however, the State Board was able to report an actual decrease in the number of persons treated in dispensaries in the State of New York, and especially in the dispensaries of Manhattan, although there was a slight increase in attendance in Brooklyn, the Bronx, Queens, and Richmond. The number of treatments given in dispensaries in the entire State during 1906 was 32,273 greater than in 1905, and presented a grand total of 2,927,351. In order to show the magnitude of the dispensary work done in the State of New York, let me quote here figures representing the number of persons treated, the number of separate treatments given, and the number of dispensaries in the State of New York in 1903, 1904, 1905, and 1906.

TABLE SHOWING THE WORK OF THE LICENSED DISPENSARIES IN NEW YORK STATE FOR THE YEARS 1903, 1904, 1905, AND 1906.

	Number of Dispensaries (1903).	1903.	1904.	1905.	1906.
NUMBER OF PERSONS TREATED.					
Manhattan	60	861,021	860,214	869,866	852,200
Brooklyn	31	115,248	110,480	111,259	117,445
Bronx, Queens, and Richmond	5	4,662	9,646	13,190	16,280
Total in New York City	96	980,931	980,340	994,315	985,925
Outside of New York City	28	28,929	28,994	29,737	35,398
Grand total in the entire State	124	1,009,860	1,009,334	1,024,052	1,021,323
NUMBER OF TREATMENTS.					
Manhattan	60	2,389,993	2,397,838	2,452,814	2,456,783
Brooklyn	31	282,394	289,678	300,448	311,809
Bronx, Queens, and Richmond	5	23,283	29,456	32,944	39,641
Total in New York City	96	2,695,670	2,716,972	2,786,206	2,808,233
Outside of New York City	28	100,239	108,677	108,872	119,118
Grand total in the entire State	124	2,795,909	2,825,649	2,895,078	2,927,351
NUMBER OF PRESCRIPTIONS.					
Manhattan	60	1,910,956	1,930,489	2,029,890	2,024,519
Brooklyn	31	200,247	188,0.7	195,573	198,419
Bronx, Queens, and Richmond	5	15,331	18,402	20,366	25,133
Total in New York City	96	2,126,534	2,136,908	2,245,829	2,244,308
Outside of New York City	28	47,043	49,198	44,252	53,553
Grand total in the entire State	124	2,173,577	2,186,106	2,290,081	2,297,861

Before passing judgment on the present New York dispensary law, we must inform ourselves on several points: First, what are the purpose and the main terms of the law; and, second, how far are the rules which it prescribes complied with. Both the requirements of the law and the extent of compliance with its various provisions (unimportant as well as important) are shown in the following table:

COMPLIANCE WITH DISPENSARY RULES OF 123 LICENSED DISPENSARIES IN OPERATION ON SEPTEMBER 30, 1906.

Rules.	Yes.	No.	In part.	Not applicable.
I. Public notice posted	120	3		
II. 1. Registrar	123			
2. Deputy (not required)	65	58		
3. Makes and preserves records	114	. .	9	
4. Receives applicants	123			
5. Sees that rules are enforced	23	. .	100	
III. 1. Examines all applicants	123			
superficially 25				
fairly well 84				
thoroughly 14				
are any refused admission	86	37		
a. Emergency cases admitted	120	. .	. .	3
b. Poor applicants admitted	123			
c. Doubtful cases admitted upon signing representation cards	91	32		
d. Subsequent investigation made	51	72		
e. Results of investigation filed	47	4		
f. Non-signers refused admission	52	1	. .	70
2. Representation cards in proper form	116	7		
3. a. Pass cards issued	122	1		
b. Penalty printed thereon	122	. .	. .	1
IV. 1. Matron	123			
2. Cleanliness and order preserved	121	. .	2	
3. Present at gynecological examinations	100	. .	. .	23*
V. 1. Contagious diseases excluded	123			
2. Registrar prevents exposure	123			
3. Registrar reports to health authorities	123			
VI. 1. Clinical or other instruction given	32	91		
2. Treatment conditional thereon	. .	32	. .	91
3. Consent of patient obtained	32	. .	. .	91
VII. 1. Apothecary (not required)	107	16		
2. Licensed or medical graduate	101	6	. .	16†
3. Appointed under Civil Service rules	6	. .	. .	117‡
VIII. 1. Board of Health ordinance observed	123			
2. Minute made before September 30	96	27		
IX. 1. Seats for all applicants provided	118	5		
2. Sexes separated in (a) waiting rooms	93	23	. .	7
(b) treatment rooms	107	9	. .	7
3. Suitable for equipment and supplies	118	1	4	

* Such examinations not held in these dispensaries.

† No prescriptions compounded in these dispensaries.

‡ Applies only to eight dispensaries connected with municipal hospitals in New York City.

The New York State Board of Charities, in a recent report, calls attention to the fact that compliance with what it regards as the "crucial point" in the proper administration of dispensaries, viewed from the social standpoint, namely, the examination by the registrar of applicants for treatment, is not uniformly thorough. In 1906, the examination by the registrar of applicants applying for treatment was reported as being done thoroughly in 14 dispensaries; in 84 dispensaries it was reported as being done fairly well, while in 25 dispensaries the work was found to be done only superficially. "It would seem," says the Board, "that the doors of the dispensaries of the State are reasonably well guarded in a large majority of cases; that they are partially protected in most of the remaining instances, and that they are not wholly unguarded, except in a very small number of cases." We are left to infer that the full and complete opera-

tion of the "crucial point" of the law, that is, the inquiry into the social status of applicants by the registrar, will still further, but in a relatively slight degree only, check the increase in dispensary attendance; but that any marked decrease in dispensary attendance, and hence, with the facilities at present existing, any better opportunity for close attention to the individual case, can result from even the most rigid application of the present law, is not to be hoped for.

It is beside the purpose of the present article to attempt to correct the published figures in regard to dispensary attendance, although it must be recognized that statistics of dispensary attendance cannot be accurate so long as dispensaries differ in their methods of recording patients, visits, and treatments, and so long as there is no method of determining the number of "rounders" registering simultaneously or successively in more than one dispensary. But whatever the percentage of error in the figures gathered by the State Board, the facts remain that the existing dispensaries of New York are, in the main, overcrowded; that under conditions of overcrowding and hurry, standards of treatment are inevitably low; and that after seven years of legal prohibition of the use of dispensaries by patients able to pay, but with *no plan or machinery for the routine registration and investigation of all cases* the general level of dispensary work is not materially higher than before; and the crying evils of overcrowding, superficial examination, and careless and ineffectual treatment, are unchecked.

The dispensary law of the State of New York is a conservative measure, drawn by men fully cognizant of the facts in regard to the abuse of dispensaries by a socially undeserving class; familiar, apparently, with the fraudulent practices of so-called dispensaries conducted for private gain under the cloak of charity; and informed as to the tendency of not a few dispensary managers to be careless about certain details of hygiene and to overlook certain considerations of decency in the grouping of the sexes and in the examination of female patients.

But the framers of the law, while seeking to suppress fraud and misrepresentation, were evidently desirous of interfering as little as possible with the managers of dispensaries honestly philanthropic in motive. So far as it is possible to judge from the terms of the law, there was no thought, in the minds of its framers, of compelling dispensaries to limit their work to dimensions consistent with their facilities; no idea that a system could be and should be worked out, by which applicants for dispensary relief would be compelled in every case to prove their right to the relief offered them. And yet it is plain that there is a sort of swindle, unconscious perhaps, but none the less real, in the attempt to make a relatively small dispensary organization meet the needs of an unlimited number of patients; and the lesson of the need for and the value of routine investigations of applicants for relief, long ago taught by the modern

school of philanthropy, is today a recognized feature of all kinds of relief work except that of hospitals and dispensaries.[3]

By comparing with the present New York law a list of the remedies for dispensary evils suggested to the Committee of the Philadelphia Hospital Association, we shall see at a glance to how great an extent the New York law conforms to the existing state of current critical opinion.

Remedies Suggested by the Philadelphia Committee.	New York Law.
(*a*) Cards to be issued by the clerk under direction of dispensary.	(*a*) Pass cards issued bearing copy of section of law declaring false representation by a dispensary applicant to be a misdemeanor.
(*b*) Cards to be issued for investigation.	(*b*) Investigation of all doubtful cases required immediately *after* first treatment.
(*c*) Patients to present certificate from minister or physician.	(*c*) Such certificates not needed where doubtful cases are investigated.
(*d*) Refuse those able to pay.	(*d*) This is the purpose of the New York law.
(*e*) Fewer dispensaries.	(*e*) All dispensaries must be licensed by the State Board of Charities. Since the enactment of the law a number of applications for licenses have been refused.
(*f*) Cards to be issued by persons in charge of a district.	(*f*) All investigations are conducted by the Charity Organization Society, and Manhattan and the Bronx are treated as one district.
(*g*) Cards to be issued after patient signs statement of need.	(*g*) Provided by the law.
(*h*) Charge those able to pay for medicines.	(*h*) The law forbids any charge, whether for treatment or medicines, which shall have reference to the value of the thing furnished. Theoretically, persons able to pay either for treatment or medicines, are expected to obtain private aid. The charge of 10c. made in most New York dispensaries for medicales is a nominal charge, theoretically, having no relation to the value of the service rendered or the medicine furnished, though in most instances probably covering the actual cost of the medicine itself.
(*i*) Investigate homes of patients.	(*i*) Such investigations provided for in doubtful cases only.
(*j*) Signs in dispensaries announcing that treatment is for the sick poor only.	(*j*) Dispensaries required to post conspicuously in reception rooms, notices stating that the dispensary has been licensed to furnish relief to the sick poor who are unable to pay for same.

While the New York law has been of undoubted benefit, its most important public services have been the abolition of the "fake" dispensary through the use of the licensing power, and the gradual promotion of order, decency, and cleanliness in legitimately conducted institutions. The law has brought about no radical reform in the manner of conducting dispensaries; it has not raised, nor has it sought to raise, the standard of therapeutic achievement; nor has it attempted to bring about a more perfect correlation between dispensaries, hospitals, and the various relief agencies capable of playing an important and helpful role in improving the health of

[3] Since the beginning of the present year (1907) Mt. Sinai Hospital has employed an investigator to inquire into the validity of the claim for free treatment of every in-patient admitted to its public wards. Of the first 1500 free cases investigated, 45 were found to be able to pay seven dollars per week for an average of three weeks' treatment. Seventy others were classed as doubtful, but declined to pay.

dispensary patients. It has not provided, nor has it attempted to provide, a complete system for the automatic exclusion of improper applicants; it has not eliminated the "rounder;" it has not made overcrowding impossible, nor has it insured the continuous development and improvement of dispensary work.

THE DEMAND FOR EFFICIENCY IN DISPENSARY WORK, AND THE CONDITIONS UNDER WHICH EFFICIENCY MAY BE ATTAINED. It must be conceded that dispensary work will always be poorly done while the leading dispensaries, doing the bulk of the work in the city, are overcrowded as at present; that the elimination of undeserving applicants (not the occasional and accidental detection of misrepresentation, but actual knowledge and use of the knowledge of the financial status of all applicants) would aid in reducing the number of dispensary cases to practicable proportions; that such elimination cannot take place so long as patients are free to roam over the city from dispensary to dispensary without fear of detection or punishment; and, finally, that some method of limiting the number of patients in proportion to dispensary facilities, must be introduced as the basis of any really effective reform.

Let us not suppose, however, that we have merely to establish conditions under which careful diagnosis and intelligent consideration of the needs of each patient may be accomplished. The establishment of these conditions will at once bring into the foreground the importance of environment as a factor in the causation and cure of disease; then will follow a demand for the creation of machinery for the study of the patient's environment, and, finally, a realization of the necessity of extending the work of the dispensary, in suitable cases, into the home and the workshop. Appreciation of the influence of environment in disease has already led to the organization of social work on a large scale in the battle against tuberculosis; to the organization of societies for the promotion of tenement house reform; to the movement for the regulation and control of injurious trades. While it is the function of these latter organizations to deal with questions of public health from the standpoint of public prophylaxis, it is the place of the dispensary to seek out and to deal with conditions of living injurious to the individual patient.

Dr. Cabot has divided into two groups, which he terms, respectively, "organic" and "functional," cases commonly treated in the out-patient department of the Massachusetts General Hospital in 1904. In the group of functional diseases he has included constipation, dyspepsia, debility, neurasthenia, headache, and other pains without known cause, hyperchlorhydria, alcoholism, and other conditions in which the patient needs above all else, a correction of faulty habits and the practice of hygiene. These reforms are not easily or quickly won. "To obtain them there may be needed" (I quote Dr. Cabot's succinct recommendations) "sometimes careful instruction both at the dispensary and in the home; sometimes the

patient must be removed from the friction and worry of home conditions and started afresh elsewhere (vacation, change of scene, convalescent home); sometimes he must be helped to get the necessary but somewhat expensive means of recovery—a set of false teeth, an abdominal supporter, a nourishing diet, a vacation." Here we have in a nutshell the problems which will have to be met in the future by dispensaries which aim at genuine amelioration of the condition of every worthy applicant for relief.

THE VISITING NURSE AND THE DISTRICT PHYSICIAN OF THE PRESENT DAY. The association of home visiting with dispensary work is not a novelty. District visiting by medical men on behalf of dispensaries, historically antedates by far the now popular independent district nursing movement. Of late a few of the dispensaries of New York, especially those engaged in tuberculosis work, have developed a system of home treatment or supervision in connection with dispensary cases. Before undertaking to describe this work, which in its principles and methods furnishes a model for dispensary work generally, let us glance for a moment at the work of the district nursing organization as it is conducted in New York today.

Miss Wald, of the Nurses' Settlement, states the need of district-nursing organizations in the following words: "District nursing, or a comprehensive system of care for the sick poor in their own homes, demands serious consideration, because the hospitals of the city are admittedly able to care for less than one-tenth of the sick of the city. On account of the high cost of hospital care, it is useless to hope to approximate the needed relief of the sick by hospitals, and other methods are thus brought before the community. There must always be great numbers for whom home care is impossible—patients who, regarded from the medical viewpoint, require the service that the hospital alone can give; but it is also true that their [hospital] places are frequently appropriated by patients who might be cared for in the home if proper nursing could be secured."

While the Nurses' Settlement, the leading and perhaps most highly-developed organization of its kind, coöperates with private physicians as well as with hospitals, dispensaries, and other charitable agencies of every description, an examination of the report of cases treated by the Nurses' Settlement shows that the admirable work done by this and other district organizations of similar scope, does not reach any large number of those dispensary patients who most need to be followed to their homes.

In 1905, 5032 cases nursed by the Henry Street or Nurses' Settlement, were classified as follows:

Unclassified medical	1735
Unclassified surgical	602
Pneumonia and bronchitis	956
Tuberculosis	296
Gynecological	212
Burns	197
Rheumatism	158
Obstetrical—normal and abnormal	155
Meningitis	123
Typhoid fever	122
Contagious	119
Ulcers	118
Cardiac	97
Eye diseases	90
Alcoholism	6
No illness	46
Total	5032

Further light is thrown upon the character of these cases by the report of their final disposition, which I quote as follows:

Cured	2624
Hospital	740
Dispensary	598
Investigations	342
Died	312
Special nurse	165
Department of Health	69
Carried over in 1906	182
Total	5032

This report shows how close is the contact between the district nursing association and other relief organizations; it shows also that while nurses identified with district-nursing organizations are in touch with thousands of homes where medical advice and nursing aid are needed (and are, no doubt, given freely and wisely), these nurses are called more especially to the homes of acutely sick persons, and are only to a very limited extent in touch with the many thousands of dispensary patients suffering from disorders of the functional variety or from chronic organic disturbances associated with mild if depressing symptoms—diseases directly traceable to or seriously influenced by habits of living. Hence, if the dispensaries are to undertake to develop their work along the most effective lines, they must build up district organizations of their own, must follow patients from the dispensaries to their homes, and there endeavor to inculcate habits of life consistent with health. Now, aside from the more recently developed work of the tuberculosis clinics, the home visiting, so long established in connection with the older dispensaries of the city, is much narrower in its purpose than the kind of visiting here proposed.

There are in New York city today fourteen dispensaries having outdoor or visiting physicians and nurses. Years ago, the lower part of Manhattan Island, then the city of New York, was subdivided into districts by six dispensaries, each of which appointed one or more district physicians. The duty of these physicians was to visit patients who were reported by their friends at the dispensary as being too sick to call there for treatment. The Good Samaritan (then the Eastern) Dispensary undertook to took after the district east of First Avenue and south of Fourteenth Street; the De Milt Dispensary assumed charge of the district on the East Side lying between Fourteenth and Fortieth Streets; the Northeastern Dispensary, the district included between Sixth Avenue and the East River, between Fortieth and Eighty-sixth Streets. The West Side was similarly subdivided, the southernmost portion being assigned to the New York Dispensary, the central portion to the Northwestern Dispensary, and the northern extremity of the city, at that time extending to Eighty-sixth Street, to the Northwestern Dispensary. The system then established has been continued to this day without change of district assignment, regardless of the fact that the Nurses' Settlement and other agencies, too numerous to mention, have since entered the field ready to share the burden. Indeed, but for the birth and growth of these new organizations, the dispensaries mentioned would have been overwhelmed by the increasing demands of a rapidly multiplying population.

The extent of the district work of the eleven New York dispensaries now registering the largest number of home visits (whether by physicians or nurses) is shown in the following table, compiled from the official reports:

	No. of patients visited in homes.	Total No of visits.
New York Infirmary for Women	1396	11,272
New York Homœopathic Medical College	1912	8,092
Northeastern Dispensary	2847	8,370
Northwestern Dispensary	5061	11,115
Northern Dispensary	2915	5,779
Presbyterian Hospital (including visiting for the Tuberculosis Class of the Vanderbilt Clinic)	5080	16,641
De Milt Dispensary	2283	8,193
Good Samaritan Dispensary	5007	6,554
New York Dispensary	1447	3,093
Vanderbilt Clinic	829	7,149
Eclectic College Free Dispensary	1216	3,167

I am indebted to eight of the dispensaries now doing district work for the information contained in the appended table:

Name of dispensary.	Date of beginning of district or home work.	Number of persons engaged in such work. 1. Physicians. 2. Nurses. 3. Others.	How many receive salaries? 1. Physicians. 2. Nurses. 3. Others.	Are salaries paid, if any, drawn from the general funds of the dispensary, or are they contributed by coöperating societies or individuals?
Flower Hospital Dispensary	1899.	11 physicians, 2 medical students.	None.	General Funds.
Northern Dispensary	1828. ?	4 physicians, 1 nurse.	4 physicians.	General Funds.
New York Dispensary	Before 1887.	2 physicians, 1 nurse.	2 physicians, 1 nurse.	General Funds.
New York Infirmary for Women and Children	1853 (by Dr. Elizabeth Blackwell).	1 nurse.	None (pupil nurse).	General Funds.
Northeastern Dispensary	1862.	2 physicians.	2 physicians.	General Funds.
Good Samaritan Dispensary	1892.	1 physician, 1 nurse.	1 physician, 2 nurses.	General Funds.
Vanderbilt Clinic	February, 1903.	4 physicians, 5 nurses, 1 social worker.	5 nurses, 1 social worker.	Individual contribution.
Presbyterian Hospital Dispensary . . .	February, 1904.	20 physicians, 6 nurses, 2 social workers.	3 nurses.	From special fund.

Name of Dispensary.	Is the home or district service intended exclusively for the benefit of patients who are too sick to call at the dispensary?	Are the physicians and nurses engaged in district work expected merely to give immediate relief to patients, or are attempts made to aid the patient to attain a higher plane of living?	Are funds for the relief of patients in distress at the immediate disposal of the District Staff?	Does the District Staff regularly coöperate with relief agencies other than hospitals?
Flower Hospital Dispensary	Exclusively for patients too sick to call.	Sole aim to heal the sick; social work not attempted.	No.	Not regularly.
Northern Dispensary	Exclusively for patients too sick to call.	Physician's chief duty medical relief; would also observe hygienic conditions.	No.	No.
New York Dispensary	Exclusively for patients too sick to call.	Physician's chief duty medical relief; would also observe hygienic conditions.	No.	With Charity Organization Society at times.
New York Infirmary for Women and Children	Exclusively for patients too sick to call.	Contact continued until patient is well; patients to come to dispensary when able.	Yes.	Use own funds usually; sometimes call in the "diet kitchen."
Northeastern Dispensary	Exclusively for patients too sick to call.	Sole aim to give physical relief—medical or surgical.	No.	Yes.
Good Samaritan Dispensary	Exclusively for patients too sick to call.	Reports Charity Organization Society.	No.	Yes.
Vanderbilt Clinic	Instruction of family of tuberculosis patients; and to dispensary patients unable to return.	Nurse in charge also represents New York Association for Improving the Condition of the Poor. Social worker advises as to employment, etc.	Immediate relief given by Association for Improving the Condition of the Poor.	With United Hebrew Charities, Charity Organization Society, Association for Improving the Condition of the Poor, and fresh air agencies.
Presbyterian Hospital Dispensary . .	Volunteer physicians reach patients too sick to call and nurses reach other classes.	An attempt is made to improve living conditions.	Small fund available for immediate temporary relief.	Coöperates with large number of relief agencies.

The tabulation here given shows the scope of home visiting by medical men and nurses, as practised by dispensaries which have introduced these features into their daily work. The great value of the work done is unquestionable; its inadequacy fully to meet the needs of the dispensary population of New York city is equally beyond doubt.

THE NEWER AIMS OF THE TUBERCULOSIS CLINICS. Space forbids a full description of all the work now being done by the tuberculosis clinics of New York, including those of the Department of Health, Bellevue and allied hospitals, and certain voluntary institutions. In order to picture the aims of these clinics, I can do no better than to quote briefly the words of Dr. Linsly R. Williams, who directs the tuberculosis work at the Vanderbilt Clinic: "The work is educational, therapeutic, and humanitarian. The patient is taught by the doctor; and the patient and his family are taught by the nurse, who visits them in their homes, how to lead more hygienic and healthful lives, and, best of all, how to prevent others in the family of the tuberculous patient from taking the dread disease.

"In treating the poor, especially in a chronic relapsing disease such as tuberculosis, it is of the utmost importance for the physician to gain the patient's confidence and instruct him most carefully, to the minutest detail, how the patient may best care for himself in spite of bad housing and insufficient food.

"Treatment must be obtained for a patient in a sanatorium if he be an early case, in a hospital if he be far advanced and hopeless. In either case, the family is left penniless if the patient be husband and father, and means must be found to support them in the absence of the wage earner. This is a detail in which many of our New York dispensary physicians fail. A special effort is made at the clinic, by means of the nurses, to see that housing and food are obtained and maintained. The nurse is also of inestimable value in seeing that the doctor's orders are carried out, windows kept open, children sent out, sputum burned. Every means available to the New York tenement-house population is tried, to give the patient the most of fresh air and hygiene.

"The humanitarian value of the work is only a little removed from the therapeutic value, for is not treatment, or therapeutics, the attempt to relieve the sufferings of the sick, and to restore them to health in the quickest manner possible? Every therapeutic measure is really also humanitarian. If a patient, to keep up his strength and his ability to work, needs extra nourishment, milk and eggs are given him, for what good does it do to improve the appetite with tonics when there is no food to satisfy the hunger. When further relief is needed for rent, coal, supplies, etc., it is given by the New York Association for Improving the Condition of the Poor, the Charity Organization Society, or the United Hebrew Charities."

The work of the tuberculosis clinics illustrates principles and

methods properly applicable to a large percentage of the cases which are now treated in the non-surgical departments of general dispensaries.

VIEWS OF DISPENSARY PHYSICIANS. I am able to present in outline the opinion of a number of physicians actively engaged in dispensary work in New York, who very kindly replied to the following letter of inquiry addressed to them on behalf of the Committee of Investigation of the Hospital Conference of the City of New York:

"DEAR DOCTOR: I am endeavoring to ascertain, for the Committee of Investigation of the Hospital Conference, whether or not it would be wise for the non-surgical departments of the dispensaries of New York generally to add to the work done, work to be carried on by salaried physicians and nurses in patients' homes.

"It is evident that in a large number of cases the ailment for which the patient seeks relief at the dispensary is directly or indirectly traceable to conditions of living or working which are more or less remediable; that the amelioration of these conditions can only be attempted when the conditions are known; and that they cannot be known unless the dispensaries can command the service of workers in the field.

"Incidentally, of course, the organization of dispensary work on the "district" plan would involve the registration and the home investigation of all applicants for treatment, and would thus enable the dispensaries to discover and to refuse treatment to patients who, under the prevailing conditions, abuse the privilege of free medical aid.

"May I beg for a reply to the following question: What proportion of the cases now treated in your department of the ———— Dispensary probably fall in the class of those who ought to be followed to their homes for the teaching and enforcement of hygienic living, and the prevention or cure of disease?"

The replies, in part, were as follows:

Dr. F. I. Wachenheim: "Perhaps a fourth or a sixth of my patients at the dispensary would be benefited by such visits as you mention; about a tenth should be treated in their homes, being not properly hospital cases, nor, on the other hand, proper subjects for ambulatory treatment. Another tenth are altogether unworthy of institutional aid and should be excluded by a better system of investigation; this last group has been steadily growing. The work should, of course, be paid for, but it is difficult to secure efficiency, at least at the salaries hitherto offered."

Dr. Sidney A. Stein: "Such a plan as you propose would be extremely useful. The class to which it would apply in our dispensary is very large: (1) The tuberculous cases; (2) the large number suf-

fering from various chronic disorders for which there is no suitable hospital, even when suffering from acute exacerbation, such as cardiacs, nephritics, and diabetics; (3) I would estimate that at least 90 per cent. live under bad hygienic conditions, which could be at least ameliorated, if not done away with."

Dr. Hughes Dayton: "A very small proportion of the cases treated in the medical department of the New York Hospital Out-patient Department are those which ought to be followed to their homes as you suggest. Certain types of cases obviously require such attention, and we hope to accomplish this to some extent by securing the services of a visiting nurse. It is my idea that she should visit all tuberculous cases, cardiac and nephritic cases, whose condition is such that rest is essential, and who would be injured by the exertion of coming to the out-patient department more often than is absolutely necessary, and certain acute cases which demand confinement to bed and observation, yet for personal reasons, or on account of crowding of the wards, are not admitted to the hospital, etc. The idea of a salaried physician to follow such cases—preferably one of the out-patient staff who has already examined them—is one whose chief drawback is the difficulty of securing an appropriation.

"Concerning the disadvantages of the scheme of districting the city, it must be recognized that while systematic house treatment would allow investigation of applicants, and thus tend to decrease the abuse of free medical aid, it would, unless restricted closely, have two unfavorable effects. The ignorant class which fears and avoids hospitals, would be less than ever inclined to seek admission into the wards, if home treatment could be secured, and thus would increase the burden upon the district physician as well as decrease their own opportunities for recovery by remaining in unsuitable environments without constant nursing. Again, if the city were districted, and a certain class knew that salaried physicians could be obtained to care for them in their homes gratis, they would use and abuse the privilege rather than pay a private physician or make the effort to come to the out-patient department. If these objections could be overcome and the district physicians were authorized to refuse treatment at their discretion, much good might be accomplished.

"You speak of the necessity of house investigation of all applicants for treatment. How this could be done without great expense is difficult to see, considering the number of new cases applying daily. Of course this is the only way to stop the abuse of the dispensary."

Dr. Isador Abrahamson: "I endorse fully your recommendations, but would suggest widening the scope of patients' treatment. Patients suffering from the various so-called functional nervous diseases, including neurasthenia, hysteria, choreic habits, spasms, also the milder types of psychoses, lasting either a brief time or re-

maining mild for an indefinite period (phobias, compulsory ideas, hysterical psychoses, etc.); also various organic diseases of the nervous system where it is impossible for the poor patient to come to the dispensary or where essential portions of the treatment must be done at home; all these form even more gratifying objects as far as results are concerned than others that are taken care of in sanitariums, homes, and hospitals.

"Hospitals as a rule refuse to accept "nervous cases," partly due to their inability to give them the proper treatment. They are thus in a miserable plight—misunderstood at home, not accepted anywhere, they come to dispensaries where the lack of time prevents a thorough inquiry into those home conditions usually at the basis of their troubles. They require proper home instruction in cleanliness, proper feeding, the need of light and air—in short, hygienic rules; secondly, home instruction in various hydriatic methods; thirdly, home instruction in massage, in frictions; fourthly, instruction in care of the bed-ridden invalid, avoidance of bed-sores, etc.; and lastly, the explanation at length to the rest of the family of the nature of the illness, the need of forbearance, etc., especially in neurasthenia, hysteria, mild pyschoses, etc., and so on."

Dr. H. Schwarz: "Your proposal certainly represents one step in advance in the proper care of our ambulatory sick, but I would take the liberty of adding that it is not the first step that ought to be made. You mention "organized and paid work outside the dispensary;" this should first be brought about within the dispensary. There should be one or two heads to each department, who should be required to attend regularly *every day* and should be paid for so doing. The patients should have the privilege of coming every day if necessary and of seeing the same physician. On Sundays and holidays one man should be delegated to see the urgent cases, or those under daily observation. With this system of daily supervision our patients would not go from one dispensary to another, or from one to another department of the same dispensary, and they could be treated with greater success; in addition, the physicians attending the clinic would get better training in their respective branches. "Even with the above scheme in operation there is need for a service to investigate the mode of living, etc., of our patients. At least 10 per cent. of our patients would be better off for advice and practical knowledge in hygiene; home instruction is especially needed for the parents of artificially-fed infants."

Dr. M. Katzenberg: "The great majority of patients ought to be followed to their homes for the teaching and enforcement of hygienic living; but the only ones who should be helped and given good advice at their homes are the really worthy sick ones. There is need of a very thorough investigation of this dispensary question. Thorough work can only be done when the city is divided up into small districts and a reliable medical census taken."

Dr. George Mannheimer: "Fully one-half the number of our medical patients at the Mt. Sinai Dispensary ought to have home supervision. In the case of tuberculous patients the value of this measure is well understood. The tuberculosis dispensaries could not do their work without it. The majority of our patients suffer from gastro-intestinal disturbances, induced chiefly by faulty living. To correct this would be the proper treatment. But here is our difficulty. We do not know what our patients eat; how they prepare their food; what articles of food are accessible to them; under what names the ordinary foods that we recommend are known to them. Of course, we ought to know something about the sanitary condition of their homes and workshops, and about the nature of their occupations. Visiting physicians and nurses would greatly assist us by supplying this information and ameliorating these conditions."

Dr. James Morley Hitzrot: "We attempt in the New York Hospital, largely through personal efforts, to see that our cases of surgical tuberculosis have fresh air, etc., and are often able to correct their ideas of ventilation and diet with some benefit to them."

THE PROGRAM. In conclusion, I present the following program, which, if carried forward with a determination to stop at nothing short of the highest attainable efficiency, will create a new order of things in dispensary work, and through a well-organized and properly controlled dispensary system, will influence in a marked degree the health of the community.

(*a*) *The Principle of Restricted Numbers.* The first aim in any scheme of dispensary reform must be the prevention of overcrowding. Not until the number of dispensary patients to be examined is reduced to reasonable proportions can careful physical examination, proper history-taking, and accurate diagnosis, be expected.

The facilities of the existing dispensaries can easily be calculated; normal standards of attendance can be fixed, and the dispensaries can then decline to admit additional patients. If for any reason individual dispensaries continue to prefer quantity to quality in their work, and decline to impose voluntary restrictions upon themselves for the sake of the greater efficiency which would result from such restrictions, it will then be in order to request the State Board of Charities to replace its present unlimited license by a new form of license, stating the number of patients which a given dispensary, with specified facilities, will be permitted to admit for treatment.

If, when this has been done, it is found that more dispensaries are needed, private charitable enterprise will probably supply the deficiency; in the absence of such volunteer relief, the municipality must provide such dispensary facilities as are needed. It is doubtful, however, that additional dispensaries will be needed if the principle of restricted numbers is adopted as *one step only* in the

scheme of reform; if, while seeking to establish new and higher standards in dispensary work, we at the same time encourage dispensaries to make better use of the buildings and the organizations under their control, and if we furthermore adopt an effective plan for the total exclusion from dispensaries of patients who owe support to the medical profession, and have no proper claim upon charity.

(*b*) *The classification of dispensary cases into* (1) *those needing dispensary relief only, and* (2) *those needing social aid or guidance.* With the acceptance of the principle of limited numbers (a principle as clearly necessary here as in the management of hospitals, the capacity of which is assumed to be fixed by the number of beds and the general resources of the organization), overcrowding and the indifferent work resulting from overcrowding, will cease; not until then can cases be separated into those two great groups whose different needs demand a splitting of the dispensary staff into two forces—one for duty in the dispensary, the other for work in the outer field. And what are these two great groups? The first, found chiefly in the surgical departments, consists of patients requiring dispensary relief only; the second, centred in the non-surgical departments, includes all patients who must be followed to their homes in order to effect a cure. Each dispensary, having classified its patients in the manner indicated, can then undertake to carry out that higher therapeutics, which does not content itself with iron and the unenforced recommendation of fesh air for anemia and debility, or with tonics or laxatives for obscure disorders generally, but which searches diligently for the causes of disease, and calls to its aid all the forces of the community capable of changing an injurious environment into a healthful one.

(*c*) *The Tightening of District Lines, and Its Influence in Controlling Misrepresentation.* It is safe to assume that, in spite of the inconveniences of urban travel, patients moved by habit, by sectarian bias, by the greater reputation of some dispensaries, or by dissatisfaction with the results of treatment, will continue to come to dispensaries from distant parts of the city. But just as dispensaries have imposed upon themselves voluntary limitations with regard to their present district or home work, can they gradually limit the residential district from which any patients will be accepted. By a voluntary understanding, dispensaries can thus lay the foundation of a system of district apportionment, ultimately to be established and regulated by law.

With district lines drawn tighter and tighter, misrepresentation by patients able to pay for medical treatment will become increasingly difficult, and a large number of those who now seek the aid of dispensaries, but who are able to pay for the services of private physicians, will find that they cannot escape detection. Misrepresentation will be automatically exposed if attempted by any of the

patients falling within the group of district or home-visited cases; and the wrongful use of dispensaries will thus tend to diminish in proportion to the development of district work. The investigation of cases of doubtful financial standing, not requiring home treatment, may meanwhile proceed as at present; but the number of cases to be investigated will be materially lessened, and the percentage of those who can be reached by the machinery at present available, will be proportionately greater.

What the Final Organization will Include. Ultimately the city will be ready for the complete reorganization of its dispensary work under the guidance of the State Board of Charities, or a similar controlling body, upon a plan providing for the following:

1. Limited dispensary licenses, in the place of unlimited licenses, that is, limitation of the work of each dispensary to a suitable number of patients, to be residents of an assigned district.

2. Registration of all families claiming dispensary relief, and the refusal of relief (except in emergency cases) to all families not regularly registered and known, thus applying to dispensary work the methods, and perhaps, also, the machinery, of the Charity Organization Society and of other modern philanthropic associations, and while extending the scope and aims of the dispensary, at the same time restricting the aid given to those absolutely in need of it.

3. A system of home visiting, aiming at the effective treatment of functional and other disorders depending upon environment.

4. The use of the power of the State to prevent the embarrassment of existing dispensaries. This implies the encouragement of new dispensaries, voluntary or municipal, whenever warranted by pressure upon existing dispensaries.

5. Periodical readjustment of district lines to allow for shifting of population and for the enlargement of the facilities of established dispensaries. (On account of the varied character of established dispensaries, assigned dispensary districts at the outset will necessarily overlap; thus special dispensaries like those now devoted to orthopedic or to eye and ear work, with relatively extensive facilities of a certain kind, would be permitted to accept patients from districts greater than those assigned to large general dispensaries in the same locality having only limited facilities for the class of work carried on in the more highty specialized institutions.)

The reforms here proposed are restrictive and will inevitably meet with opposition; they will, no doubt, be considered especially objectionable by dispensaries which have a weakness for formidable statistics, and by those which, on account of certain college affiliations, are tempted to seek above all else a large attendance of varied cases—the larger the better for the purposes of medical teaching, no matter what the consequences to the majority of the patients, who make up the despised residue of every teaching dispensary of unrestricted growth. (I do not wish to be understood as opposing the

use of dispensaries for medical teaching. The needs of some dispensary patients are at variance with the interests of schools controlling dispensaries, but both the medical student and the patient would be in a fairer way to get what they need, if each school were permitted to utilize several dispensaries instead of a single one.) But if we accept the principles upon which the proposed reforms are based, we cannot escape the duty of endeavoring to put them into effect. The theory of limited numbers in dispensary work is vital. I venture to say that there will be no real, no far-reaching, no general dispensary reform in our large cities, until this is conceded, and that, at last, the acknowledgment of the relation between facilities, on the one hand, and effective work, on the other, will prove the means of raising our dispensaries to the top notch of usefulness.

BENIGN STENOSIS OF THE PYLORUS.

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The following study of the symptomatology and treatment of benign stenosis of the pylorus is based on the records of 11 cases which came to operation in the New York Hospital. These cases, therefore, can be definitely separated from the more frequently occurring classes of pyloric stenosis, those due to malignant disease and to the scars of ulcer.

Stricture of the pylorus is difficult to demonstrate in the post-mortem specimen, unless the occlusion be developed to a very marked degree. There are no standard measurements of the normal pylorus in adults, similar to those which have been compiled for the gastric outlet in infants. The lumen of the pylorus varies so considerably in stomachs which are evidently healthy that it is almost impossible to formulate hard and fast rules to govern comparative tests, and the common method of testing with the end of the finger is perhaps as good as any other.

It is rather suggestive to find in comparing the case histories with the pathological studies of those cases in which hypertrophy and stenosis of the pylorus have been found at autopsy, that the condition had seldom been recognized clinically. It is a fair inference and usually true that these individuals have suffered with their last illness and have died of some disease other than the gastric condition from which they must have been afflicted for years. This fact

suggests, and in a degree confirms, the statement that these stenoses are benign, not only that they are not growths of malignant nature, but also that a long life is not incompatible with their presence. This explains also why careful microscopic studies of the tissues from cases clinically diagnosticated are so few in number.

In the accounts of benign stenoses scattered through the literature numerous causal factors have been noted. Cruveilhier found a mucous polyp closing the pyloric orifice in one of his cases, and those tumors which Rokitansky examined and considered due to chronic gastritis were probably polyps of a like nature. Myxomas, myomas, and fibromas have all been described as causes of benign stenosis. The morbid changes in the structures of the pyloric ring which result in hypertrophy and stenosis usually assume one of two characters. There is either a marked increase of the glandular substance or a high degree of hypertrophy of the muscle, and one or both of these changes are found fairly constantly in specimens submitted to examination. The increased glandular tissue noted in these cases has the general architecture and appearance of Brunner's glands and is, as a rule, provided with canals leading to the mucosa.

These masses of gland substance make up at times considerable tumors which project into the pyloric canal. There is some reason for believing that this glandular growth is the primary and fundamental change which distinguishes pyloric hypertrophy; for when the muscular tissue is found developed to a marked degree, it is often associated with nests of these glands which have undergone an atrophy presumably from compression. The congenital pyloric stenosis of infants appears to be not of this nature, but to consist rather of a primary increase of the muscular layer and usually of the circular fibers. Thus Gran found in infants, in comparing sections of normal pylori with those in which there was marked hypertrophy, that the circular muscular layer was twice as thick as normal, while the longitudinal layer showed no increase. It is, however, notable that all the other tissue elements, even the serosa, were approximately double their normal thickness.

The somewhat varied morbid anatomy of these conditions ha resulted in various theories for explanation, but none of them is conformable with all the facts. Von Reckinghausen's idea of the growth of uterine tumors has been applied to pyloric tumors by Meinel and Magnus-Alsleben, and while seeming to explain some cases, it is quite inadequate in others. Although it is not impossible that some of these cases of benign stenosis originate from a congenital abnormality which does not become manifest until adult life, the history elicited from such patients not only does not suggest any such condition, but rather, often indicates a primary functional derangement which by persistence could here, as in other situations in the body, finally produce a morbid anatomical state.

The physiological investigations of Cannon, Pawlow, and Starl-

ing have made it evident that at the pyloric valve there is one of the most delicate chemical and secretory adjustments of the body. The pyloric valve remains closed until the chyme in the pyloric end of the stomach is thoroughly disintegrated and acidified; then only does it normally allow free access to the duodneum, where now the acidified chyme causes a stimulation of constriction to the pylorus which persists until the alkaline bile and pancreatic juice have neutralized the acid. The reaction of the chyme is the adequate stimulus for the reflexes which contract or inhibit the sphincter pylori, and this same stimulus produces exactly opposite results in the sphincter according to whether it is applied to the gastric or to the duodenal mucous surfaces. This adjustment alone, even without that necessary absorption of "secretions" which stimulate the pancreatic cells, is so complex and nicely regulated that it can be easily understood how neurotic states and even mere errors in diet may overthrow the balance. The hyperacidity and anacidity that are commonly noted as temporary conditions in otherwise healthy individuals must demand considerable efforts at compensation on the part of the pyloric mechanism to produce the comparatively mild symptoms that characterize them.

There are so many factors which enter into the normal physiology of the pyloric function that we can but seldom find the break in the chain which marks the first deviation from the normal in any individual case. When we study cases of benign stenosis of the pylorus, however, those signs which clinically characterize pyloric spasm, that is, pain, increased peristalsis, and vomiting, enter into the histories of the early stages of the disease, and irregular attacks of this nature are often the only sign of disordered function which may occur during long periods of time, sometimes for years. As time goes on, the periods of pyloric spasm become more and more frequent. The condition, perhaps, is not unlike that of broken compensation in cardiac disease, in which each failure predisposes to the next, and each effort at compensation falls short of the condition attained to by the one before. The following history illustrates this clinical fact:

Case I.—Lawrence F., aged forty-six years. The family history is good. The patient says he has always been well and strong up to the present sickness, which began three years ago with attacks of vomiting lasting a week. During these attacks the patient vomited three or four times a day, the vomitus being food material and greenish fluid, never any blood. After a week in this condition the patient says his normal health would return and he noted no gastric symptoms in the intervening periods. Until a year and a half ago he thinks these disturbances occurred not oftener than every four or five months, but for the last year there has been an increase in their frequency and severity. Six months ago he grew so weak that he gave up work. He is now vomiting three or four times daily, has

lost much in flesh, his appetite is poor, and his bowels very constipated. He has never vomited any blood, nor noted tarry stools. Examination showed a dilated stomach. The other organs appeared normal. At operation there was found a hard, thickened pylorus, the lumen of which admitted a 20° F. sound. A section of the pylorus removed at operation showed a marked increase of fibrous tissue.

This case presents a typical history of this disease. The recurring attacks alternating with shorter and shorter periods of normal health are often accompanied by a gradual change in the gastric juices as evidenced by the secretion of HCl, by signs of stasis and fermentation, and in some cases by absence of pepsin (Case XI). The periodicity of the process, slowly merging into a permanent disease entity, suggests the vicious circle, or functional habit, which characterizes so many pathological changes in their incipience and which continues until a morbid growth results. Even after correcting, as we believe, the anatomical defects in certain of these conditions by proper surgical means, health may not be restored, the vicious habit having become so established that normal gastric secretion is almost impossible.

The following patient was operated on twice and while improved was never permanently cured:

Case II.—Michael M., aged forty years, entered New York Hospital, November 26, 1890, complaining of periodical vomiting and constant gastric distress. His family and past history were unimportant. He began to have vomiting attacks five years ago, and there has been a slow increase in their frequency, until during the last two years he has been an invalid. On account of the constant distress and frequent vomiting he has lost flesh and strength. He has seen several physicians and the diagnosis of carcinoma has been made. Examination showed a dilated stomach, but no tumor. The gastric contents after test meals contained large amounts of free HCl; there were signs of stasis, but no blood. The stomach capacity was ten pints. A gastro-enterostomy was done; the pylorus was found enlarged and indurated; there were no signs of former ulcer. Again two years later a gastroplication was performed on the dilated stomach. At the last analysis made of this patient's stomach contents he still secreted excessive amounts of HCl, and there were evidences of fermentation.[1]

While it is true that many cases of this disease after proper treatment make a recovery to complete health with almost magical promptness, yet the class of which the above case is an example, is not extraordinary. In these the underlying neurasthenic habitus, the predisposition to abnormal functional activity, prevents a quick restoration to the normal and makes a cure in any case tedious, in some impossible.

[1] Case formerly reported by R. F. Weir.

Depending to some extent on the degree of constriction at the pylorus, the stomach is either hypertrophied or dilated. In infants an hypertrophy of the whole muscular structure of the stomach, associated not infrequently with a diminution in capacity, is more common than in adults. This condition is followed by dilatation, and it may be assumed that the primary hypertrophy is an effort to compensate for a narrowed pyloric lumen. Just what the factor is other than overwork which results in the secondary dilatation is yet unknown, and again the analogy with the clinical course of cardiac diseases may not be remote, since gastric dilatation like cardiac marks a loss of power to functionate. The hypertrophied stomach in adults may give rise to symptoms, especially when it is associated with anacidity, that will make a correct diagnosis very difficult. In Case VII the history of extreme loss in weight, together with the presence of an easily palpable tumor, and with patterns of abdominal tumidity over the stomach area, might well be interpreted as carcinoma. At the operation in this case the stomach wall was found much thickened, while the mucous membrane appeared quite normal. These instances of hypertrophy without dilatation as a sequel to the stenosis, however, are comparatively rare in adults, the common effect being a dilatation. In all of our cases, with the exception of Case VII, dilatation to some degree existed. The anatomical characteristics of this condition when it results from stenosis of the pylorus are in certain respects different from those of simple dilatation. In these cases the muscle layer of the stomach is usually as thick as normal and in the pyloric end it is often considerably increased in amount. The thinning of the gastric wall is usually due to thinning of the mucosa. This remains true although the dilatation resulting from benign obstructions is the most extreme that we encounter. Such marked grades of ectasy described by Bonet in the seventeenth century, in which the lower border of the stomach reached to the symphysis and the walls were likened to soft paper, are seen but seldom nowadays, because the general use of the stomach pump, as employed by Kussmaul in treating dilatation, has removed the cause of those extreme grades of the condition noted in the older literature. There are certain symptoms presented in these cases that are due primarily to motor insufficiency, of which fermentation is one of the most prominent. It is a symptom that always suggests stagnation. If the fermentation be of an acid nature, there will be pyrosis; if gaseous, the sensation of tension will occur shortly after eating. It has been held by some that fermentation does not proceed in the stomach when HCl is present, but this idea is in error. The contrary has been proved by Kuhn and Strauss. The evidences of fermentation were quite constant in our cases, usually it was gaseous, but in 2 cases lactic acid was found in the stomach contents.

A more or less marked change in the secretion of HCl is noted

quite constantly, and it has been assumed that because a high degree of free HCl is a fairly common incident that it stands in causal relation to the spastic pylorus. The basis for this idea rests on the fact that in cases of acute pyloric spasm, in which there is frequently an accompanying increase in HCl, the symptoms are relieved by lavage. The conclusion has been drawn that we are dealing with cause and effect rather than with two results due to a third obscure factor. It is not always remembered that in acute stasis, products of fermentation are developed that might, and in fact do, produce as much irritation as a superabundance of HCl, which is a physiological secretion to which the musculature reacts only in a physiological manner. It is just possible that the increase in HCl is an effort toward compensation—in order that the thoroughly digested food may pass through the narrowed pyloric lumen when a less well-digested chyme could not. The cases wherein obstruction occurs through some agent outside of the pylorus, such as bands, adhesions, or enlarged glands, are so often marked by a hyperacidity, that the inference is strongly suggestive of this compensatory action. It is commonly accepted that the hypertrophied muscular coat is an effort of nature to force the food through its obstructed exit, and it is possible that the increase of acid may be a chemical compensation to the same end. The following cases of stenosis, due to extragastric causes, would seem to support this explanation of the hyperacidity:

Case III.—Catharine B., aged forty-two years, was admitted to the New York Hospital complaining of stomach trouble. Her past history was unimportant. She says she drinks considerable coffee, occasionally a little whisky. Her present illness began five months ago, with discomfort in the abdomen after meals. This sensation she describes as one of oppression occurring an hour or so after taking food. She has vomited often at these times with immediate relief. The vomitus consists of food material, mucus, and froth. She states that she is often able to recognize in the vomitus, food that has been eaten the day previous. She has never vomited blood. She has much thirst, passes little urine and the bowels are constipated. She thinks she has lost considerable weight. Examination showed a dilated stomach and an excess of free HCl. At operation there was found a cirrhotic liver of the luetic type, and the pylorus was bound down by a fibrous band which passed around it. This band was divided and the patient recovered complete health.

Case IV.—Patrick M., aged fifty years, complains of vomiting and loss of strength. His family history is negative. The patient has had no illness in his life except the present one. He has been a hard worker, moderately alcoholic; no history of lues. The present illness commenced three years ago with the regurgitation of sour, greenish fluid, eructations, and occasional vomiting. These symptoms have steadily increased in severity until a year ago, when he

had to give up work. He vomits frequently at present, three or four times a week, and has a feeling of oppression in the abdomen almost constantly. The appetite is good and thirst increased. He frequently notices a splashing in his stomach after meals. Examination showed a dilated stomach containing a residue after fifteen hours fasting. There was a secretion of abnormal amounts of gastric juice on an empty stomach (gastrosuccorrhœa). The secretion of HCl was increased and the urine was scanty and alkaline in nature. The cause of the constriction was found at operation to be a narrow band passing around the serous surface of the pylorus. There was no sign of an ulcer. The band was divided at the operation, but the patient died of postoperative peritonitis.

Case V presented the same findings on examination as in the previous case, and gave the same history of gastric disturbances and vomiting. The HCl determinations varied between 40 and 80. The cause of the stenosis was found at operation to be adhesions between the pylorus and gall-bladder.

We need not enter into the cause of the anatomical conditions found in these 3 cases further than that the adhesions and constricting bands were not the lesions usually resulting from ulceration, and so of themselves throw no light on the cause of hyperacidity. The fact that a gastric condition identical in anatomy and chemistry to that caused by fibrous hyperplasia of the pyloric ring can be produced by pressure on the pylorus from without proves the falsity of the theory that the hyperplasia is a result of an hyperacidity. Whether the hyperacidity be a natural compensatory effort or whether it is only another manifestation of the ultimate etiological factor, cannot at present be decided. A solution which is satisfactory must also explain the excess of HCl which is a common occurrence in peptic ulcer.

The following histories are presented in a somewhat abridged form from the case books of the hospital:

Case VI.—Annie M. C., aged thirty-eight years. The patient says that she has had good health until ten years ago. She never had any acute illness. She has always been very nervous. For ten years she has had attacks of dragging pain in the left lumbar region, accompanied by the appearance of a firm, hard mass in the left hypochondrium. During these attacks she suffers acutely, and vomits frequently; the vomitus often contains food eaten the day before. At these times her skin always becomes "mottled." These periods of pain and vomiting have grown so frequent that she is now unfitted for her duties. The patient is a neurotic woman, poorly nourished. On the left side below the costal margin there is a tumor mass. The upper border is clearly felt, the lower border is not made out. The mass is smooth and somewhat mobile. The stomach is apparently dilated. The spleen is enlarged and movable. The patient was advised to submit to an operation, which was per-

formed. Both kidneys were found movable, the left constituting the tumor mass felt. The spleen could be easily pulled down to the level of the umbilicus. Ptosis and dilatation of the stomach existed and the pylorus would not admit the end of the little finger; the ptosis produced a kinking that further narrowed the lumen. The patient was somewhat improved by efforts at fixation and pyloroplasty, but when last heard from in June, 1905, three years after operation, she was not cured.

CASE VII.—Amelia C., aged twenty-seven years, married, was admitted November 2, 1903. The family history and the past history show nothing relative to the present trouble. Three years ago the patient began to have pain of a heavy dragging nature in the epigastrium and in the small of the back; made worse by taking food. This would continue for a few days and then subside. Except for these periods of pain, she was in good health until one year ago; she did not vomit and did not lose weight. During the past year these periods of pain in the epigastrium began to recur at shorter intervals, until they were nearly constant. She vomited almost all nourishment taken; the vomitus consisted of undigested food, but never blood. Her physician gave her lavage, which relieved the pain and vomiting. During the last six months she has been worse and has vomited more frequently, the pain being nearly constant. She has lost 75 to 80 pounds in weight. The patient is a very much emaciated young woman who looks anemic, but not cachectic. The abdomen presents peristaltic-like waves over the stomach area. Just above the umbilicus and to the left there is an indefinite mass about an inch in diameter, which is very tender and apparently movable with respiration. The mass feels smooth and not very hard. The stomach is not dilated. The liver and spleen are not felt. There is no glandular enlargement. The patient was in the hospital one week on the medical side and vomited every day save one, but never vomited blood. The vomitus was usually undigested food taken eight to fourteen hours before. An Ewald test breakfast was taken twice, giving the following duplicate result: Free HCl absent; total acid 50 and 70; lactic acid present; mucus present; no blood; no Boas-Oppler bacilli. In the lavage before the test meals particles of food taken the day before could be identified.

The patient did not do well on any diet and was transferred to the surgical division for operation to relieve the stenosis. At the operation the stomach walls were found thickened, but otherwise apparently normal; there were no masses in the wall. No signs of healed ulcer were found, but the pylorus was very hard and thick. A pyloroplasty was done. The patient was discharged December 19, 1903, improved. In March, 1904, fifteen months after the operation, the patient had gained about fifty pounds in weight and looked well. She said she had no trouble with the stomach and eats everything. In January, 1905, the patient says her health is perfect.

CASE VIII.—Fred M., aged twenty-three years, was admitted January 2, 1902. Early history has no relation to present trouble. For the last fifteen years the patient says he has had attacks of pain and vomiting at irregular intervals. These attacks last three or four days and occur about once a month. He vomits undigested food and mucus. The vomiting has occurred of late more frequently and it is for this that he seeks relief. Examination was negative, except that the stomach was found to be dilated. Gastric analysis showed free HCl in excess; no blood. At the operation constriction of the pylorus without hypertrophy was found, with no signs of a former ulcer. The patient was lost track of.

CASE IX.—Patrick J. McN., aged thirty-five years, clerk, was admitted March 10, 1902, complaining of pain in the abdomen. The patient has had neurasthenia and dyspepsia since January, 1902. There has been much pain over the stomach and nausea with gradually increasing vomiting. At the time of admission, patient was vomiting everything that was taken into the stomach; was emaciating rapidly and showed very positive evidence of obstruction of the gastric outlet and of starvation. He has not been out of his room since January, and has been in bed most of the time. He has been treated for lues. At the operation the pylorus was found unobstructed, but there was a large mass of glands behind and obstructing the duodenum. Gastro-enterostomy was done and a gland removed for examination. After operation the patient continued to feel badly and vomited three to ten times a day. He was discharged March 19, 1902, unimproved. The diagnosis was, obstruction of the duodenum from enlarged abdominal glands.

The gland showed a hyperplasia of small lymphocytes and of the larger cells of the sinuses, but the process did not appear to be at all malignant. The patient was put on a vigorous anti-syphilitic treatment and the symptoms all disappeared. The correctness of the ultimate diagnosis was substantiated by the later appearance of a superficial gumma of the leg which resolved under mercurial treatment. The diagnosis which led to the operation was based on the presence of a palpable tumor mass, the dilated stomach, constant nausea and vomiting, and emaciation. No gastric analysis had been made before admission to the hospital where he was sent for operation.

CASE X.—John P., aged thirty-six years, a mechanic, was admitted February 1, 1903, complaining of vomiting and flatulence. The family and past history are negative. His habits are good. For several years the patient has had a little distress after meals, but this has not been serious and he had considered himself in good health until a year and a half ago. Then the distress became greater and he had much flatulence. The pain has never been acute and has been relieved by vomiting. The frequency of vomiting has varied, but since September, 1902, he has vomited two or three times a day. Vomitus consists of fluid and pieces of food eaten a day or so

previously, but never of blood. His general health has become impaired and he has lost strength and flesh. Aside from the stomach symptoms the patient feels well. He is poorly nourished. The stomach can be seen occasionally bulging in a powerful peristaltic wave. The stomach border comes to the umbilicus.

An Ewald test meal resulted in the removal of a large amount of fluid which contained free HCl, 12; total acidity, 52. At the second Ewald test meal 200 c.c. was removed, containing orange pulp, eaten the morning before. Analysis showed free HCl, 30; and total acidity, 53. Lavage at various times revealed a motor insufficiency and an excessive secretion. As no course of treatment benefited the patient, he was subjected to an operation, at which there was found a thickening of the pylorus with narrowing of the lumen. Gastro-enterostomy was done. Eleven months after the operation (January, 1904) the patient was at work, feeling in perfect health. He had gained thirty pounds and was using no discrimination in diet, believing his digestion to be normal.

Case XI.—Amelia J. C., aged fifty years, a housewife, was admitted December 30, 1901. The family history was negative. Patient had smallpox in childhood, but no other acute sickness. Thinks she has been a very healthy woman, but has been nervous for thirty years. For several years beginning fifteen years ago, she had "hysterical" attacks, in which she would have convulsions and remain unconscious several hours, but she has had none of these attacks for ten years. Her present illness dates from August 1, 1901, when she received a severe fright. For several weeks after this fright she vomited every time she ate. The vomiting gradually ceased, but she has taken no solid food, living chiefly on milk and broths. She has no distress on taking food, but the thought of food nauseates her. She has lost twenty to thirty pounds. Physical examination is negative except for the stomach which seems to be enlarged. While in the medical ward, she vomited food taken three days before (prune skins and orange pulp). An Ewald test meal showed that free HCl was absent; lactic acid was present; there was no blood. The patient constantly lost weight and was transferred to the surgical division on January 27, 1902.

An exploratory operation showed a tumor mass the "size of a lemon" involving the pylorus and adherent to the under surface of the liver. A gastro-enterostomy was done. The patient recovered well from the operation and was discharged, February 25, 1902, with a diagnosis of carcinoma of the stomach.

After leaving the hospital she gained in strength, and her weight increased forty pounds. She was quite well and able to do her household work until July 20, 1903, when she again applied for admission to the wards. She says she had a fall three months ago and since then she has had pain in abdomen at times. The pain is confined to the hypochondriac region and does not radiate. She has

also regurgitated food and had some distress after eating, but has not vomited. Her general health has not suffered; she has not lost flesh, but thinks she has gained during the summer.

Physical examination was the same as before. An Ewald test meal showed free HCl absent; total acid, 20; lactic acid, a trace; rennin and pepsin both absent; no pepsinogen. These results were confirmed by three test meals taken on alternate days. The patient improved on lavage and diet and was discharged August 3, 1903. The diagnosis at this time was chronic gastritis (achylia gastrica). She was re-admitted to the hospital on November 26, 1903. She has been gradually gaining strength since leaving the hospital and has had no pain or distress until five days ago, when the old pain returned and she vomited several times. She has vomited several times a day since, the vomitus consisting of greenish fluid. The vomiting holds no relation to the taking of food, but relieves the pain.

An Ewald test breakfast removed after one hour showed free HCl absent, and total acidity, 10. There was some mucus, some bile, no enzymes, and lactic acid was present. (Three test meals were made.) Lavage for the first three days after admission showed considerable bile, which later disappeared. The patient had one bad attack of pain in hospital, accompanied with vomiting of green fluid and fever of 104°. This all passed away in twelve hours. She was treated by lavage, low diet, and diluted HCl. She grew rapidly better and was discharged December 19, 1903. The discharge diagnosis was: Chronic atrophic gastritis and vicious circle. June, 1904: Patient has been well since discharge and has gained some flesh. She does her work at home and considers her health perfect. January, 1905: Health remains good. (Letter.)

This history covering four years makes the original diagnosis of cancer, in view of the patient's present health, very improbable. The case would seem to be one of true myoma of the pylorus, for the mass is still palpable in its original place and size. The present short attacks of vomiting of bile are doubtless due to a vicious circle having become established from the gastro-enterostomy operation. This symptom has caused no trouble during the last year, the patient's health remaining excellent.

A study of the symptoms of these 11 cases indicates the uncertainty of the diagnostic significance of two symptoms—gastrosuccorrhœa and achylia gastrica. The last case quoted (XI) has given a gastric analysis for many months of a typical achylia gastrica, and still the condition of the patient warrants in no wise an assumption of malignancy in the very evident pyloric tumor. In one other case of this series also, in which the stenosis was due to fibrous constriction, there was an absence of free HCl in the gastric analysis, although no test was made for the presence of pepsin. In other

words, it is impossible to diagnosticate the presence of a malignant growth from the character of the gastric secretion alone, and it is in these cases that the tests for occult blood in gastric contents and feces are of most value. Gastrosuccorrhea also was noted in two of these cases; one of these was a typical fibrous stenosis and the other showed a narrowing due to the presence of an extragastric adhesion band. This combination of symptoms, the collection of a hyperacid gastric juice in the starving stomach, known as Reichmann's disease, has been described as occurring either in the stenosis due to ulcer or from the effect of neurotic influences. The two cases recorded here (IV and X) would extend this list to include benign stenosis among the etiological factors of a gastrosuccorrhea.

Successful medical treatment will be limited to those cases of benign stenosis in which the narrowing of the stomach outlet is developed only to a very moderate degree. It is not rational to expect to overcome a marked mechanical obstruction by a strictly medical procedure. In fact, it seems probable that those cases in which medical treatment has proved sufficient to control the periodicity of the symptoms, have presented not a well-marked stenosis but more the condition of a spasm of the muscular outlet of the stomach combined with a slight stenosis. There can be no doubt that the methods of treatment which can be used to relieve a spasm of the pylorus will often control for many years these milder cases and keep the patient in a comparatively good state of nutrition, although he will never be considered in robust health.

In the cases of intermediate degree of development also a great deal of time would be saved the patient if the condition could be recognized and proper surgical measures resorted to at an early stage.

In the cases of comparatively slight stenosis (or what amounts to the same thing during the early stages of a progressively narrowing pylorus), there is a distinct indication to use the means which we have, (1) to control excessive secretions of acid by the stomach; (2) to reduce pyloric irritability; and (3) to increase the muscular activity of the wall of the stomach. One or all of these medical procedures will tend to prolong the period of comparatively good health and to postpone serious surgical procedures perhaps indefinitely.

The method of medical treatment to control the secretion of acid includes the regulation of the diet to avoid irritating highly-spiced, richly-cooked, and also poorly-cooked foods. All articles which have been fried and which contain the results of the over-heating of fats must be eliminated. The diet must be regulated also to avoid the taking of large quantities of food at any one time, including the use of bulky liquid foods, such as soups and broths. The regulation of the taking of water so that it is ingested between meals and not mixed with the food is also important. The abstinence

from irritating drinks which contain alcohol is necessary. The treatment would include also the use of gastric antispasmodics, among which one must especially emphasize belladonna, in doses of $\frac{1}{8}$ grain of the solid extract, given in pill form after meals. The systematic use of olive oil is beneficial when given in doses of from $\frac{1}{2}$ ounce to 2 ounces, usually a half hour before eating, as recommended in the treatment of gastric ulcer by Cohnheim. The combination of these two remedial measures, the use of olive oil before meals and of the belladonna after meals probably has a greater influence to control spasm of the pylorus than any other therapeutic measure, and at the same time, has a positive and distinct influence to overcome the natural tendency in these stomachs to hyperacidity.

A second important indication is to control the increased secretion of acid. In addition to this use of olive oil and belladonna, we can use astringents, particularly nitrate of silver by lavage, or less successfully in pill form. Or, we can use large doses of bismuth which seems to interfere mechanically with the normal irritation of food which is antecedent to the secretion of the acid. These last two drugs have been used particularly to influence the healing of a gastric ulcer, but they act undoubtedly in that condition not only upon the ulcer itself, but upon the hyperacid secretions as well. In addition to influencing the secretion of acid, one can overcome its effects by neutralizing the acid after it forms. Any of the alkalies are usful for this purpose, but perhaps those which do not give rise to the formation of carbonic-acid gas are better. The commonly used bicarbonate of sodium, therefore, should be discarded in favor of some of the alkaline salts and preparations of magnesium, particularly the oxide of magnesium. The magnesium preparations have also a distinct value in so far as they tend to overcome the sluggishness in the lower intestinal tract and cause a laxity of the bowels. The dose of the alkali to be used is more or less indeterminate, but a sufficient quantity should be taken to relieve pain and to neutralize the acid already formed.

The third measure of medical treatment consists in increasing the peristaltic action of the stomach walls. The one drug which is particularly useful for this purpose is ergot. The solid extract of ergot in grain doses can be combined with the belladonna already suggested and given in pill form after meals. The use of electricity has probably been of value for this same purpose and much has been claimed for it when used by the intragastric method.

The therapeutic value of the systematic use of the stomach tube is very certain, but it is difficult to control these patients in its use and they are likely to resort to the tube as soon as any discomfort follows the taking of food. In this way, they undoubtedly relieve themselves of their suffering, but they rob themselves of necessary nourishment and will often lose weight and strength more rapidly than if they are not taught this bad habit. On the other hand,

there is no doubt that the stomach tube will often cure an attack of spasm, and its careful use will help to carry these patients for a number of months or even years in comparative comfort.

In these cases of pyloric stenosis which have existed for a considerable period of time we find, as has already been pointed out, that the mucous membrane of the stomach becomes atrophic and that the secretion of the normal ingredients of the gastric juice is more or less diminished. It is necessary, therefore, to consider in certain of these cases the means that we have at hand to restore the functions of a gastric mucous membrane which is the seat of an atrophic gastritis. The usual condition is a simple diminution or absence of the hydrochloric acid. This can either be supplied artificially or the mucous membrane can be excited to renew its secreting functions. It will frequently be found that some other mineral acid will be more easily borne than will the hydrochloric acid, and diluted nitric acid or the nitrohydrochloric acid will often give better results in these cases of gastric atrophy. In any case when it is necessary to prescribe an acid for this purpose, it is desirable that it be given in small, frequently repeated doses rather than in one large dose immediately after eating. A single drop of the dilute acid mixed with a dram of water should be given every twenty or thirty minutes for four or six times during the two hours immediately following each meal. The more usual method of prescribing ten or fifteen minims of acid, no matter how well diluted, immediately after eating, is very apt to cause gastric distress. The method of exciting an atrophic mucous membrane to resume its functions consists in the use either of stimulating drugs or of stimulating foods. Saline relishes such as salted fish, caviar, sardines, taken at the beginning of a meal will often have the desired effect. The use of peppers and other condiments such as mustard, horseradish, if not overdone, is also desirable. The drugs which act as gastric stimulants are the bitters, capsicum, and alkalies. Small doses of bicarbonate of sodium, with or without bitters or capsicum, are very useful, especially combined in a capsule and given before meals; either nux vomica or the simple bitters may be used for this purpose. Of the simple bitters, columbo and gentian are perhaps the most serviceable. They may be given as tinctures or as infusions. In those cases of anacidity in which the tinctures are not contra-indicated, the small amounts of alcohol will often prove beneficial. This line of treatment is particularly useful as a sequence to operative treatment in the cases of long standing.

When all has been said, however, in favor of medical treatment of pyloric stenosis, the final resort in cases of high degree of development must be to surgery. The operations which have been suggested to overcome the condition consist of two groups, one of which includes the several methods of enlarging the narrowed portion of the alimentary canal by the operation of Mikulicz or that of Finney. The

second group includes the many forms of creating a false passage between the dependent portion of the stomach and a point in the intestine below the duodenojejunal junction. In referring any such patient to a surgeon for operation, the exact method of relief must be left to be selected at the time of operation and in accordance with the anatomical conditions found and the condition of the patient.

It might be well to record, however, some of the disadvantages of the two operations. The operation of pyloroplasty does not give as rapid relief as does that of gastro-enterostomy. The patients after these operations require careful watching and study to see that they do not return to a normal diet and normal method of living too rapidly. It will often take several months and even a year before such a patient has secured the full extent of benefit that is to follow the surgical procedure.

The operation of gastro-enterostomy on the other hand, sometimes fails to give relief by causing the condition known as vicious circle, which can only be cured by means of a second operation. The danger after this operation of a subsequent and complicating peptic ulcer in the small intestine below the anastomosis is a real danger, although an infrequent occurrence, and the disarrangement of the coils of the gut resulting from this operation may rarely be the cause of a subsequent intestinal obstruction.

Both operations have their special indications, but we must confess to a very positive prejudice in favor of the pyloric operation, because of its undoubted approach to a nearer restoration of the normal condition.

In conclusion, we would lay stress upon the fact that the surgical treatment of the stomach has its most brilliant application in cases of benign stenosis of the pylorus and we would warn most strenuously against the too long postponement of surgical interference in cases in which medicine does not promptly cause a betterment in the symptoms, as evidenced by a longer interval between the attacks of obstruction and spasm and a permanent improvement in the general health of the patient. Surgery must not be kept as a last resort, but must be given a chance to cure these patients before the stomach has become dilated beyond recovery and before the mucous membrane has lost its power to return to the normal and again to secrete a normal gastric juice.

We would lay further emphasis upon the proposition that the mere correction of the mechanical error will not suffice for the cure of these cases. After the patient has recovered from the surgical procedure, he must be given the benefit of the methods of treatment which we possess to overcome the muscular atony of the stomach wall, to control the hypersecretion of HCl, or to excite the mucous membrane to resume its normal secretory function.

The result of treatment in the 11 cases which form the basis of this paper so far as known, may be tabulated as follows:

	Operation.	*Result.*
Fibrous stenosis, 6 cases	pyloroplasty, 4	2 cured. 1 partial cure. 1 unknown.
	gastro-enterostomy, 2	1 cure. 1 partial cure.
Fibrous bands, 3 cases	relief of obstruction, 3	1 cure. 1 died (peritonitis). 1 unknown.
Obstruction from glands	gastro-enterostomy, 1	cured.
Myoma of pylorus	gastro-enterostomy, 1	cured.

HEART CLOT IN PNEUMONIA.

By Beverley Robinson, M.D.,
of New York.

The question of cardiac thrombosis in pneumonia is still interesting and somewhat undetermined despite much work and very many observations. Clinicians and pathologists of former years admitted its frequency, as we know, and numerous deaths were attributed to it. Today pathologists, especially, recognize it as occurring very rarely, and, therefore, causing death only occasionally. Indeed, postmortem records of some large city hospitals (City Hospital and Bellevue of New York) among several hundreds of cases will not show a single instance in which the clot in the heart is particularly described, or any evident importance attached to it as being instrumental in bringing about a fatal termination.

Charles Norris,[1] pathologist to Bellevue Hospital, New York, states: "Since I have been in charge of the laboratory, beginning October, 1904, we have autopsied 130 cases of lobar pneumonia, and we have no records of a single case of cardiac thrombosis." Harlow Brooks[2] states: "In a series of 84 consecutive autopsies on my pneumonia patients, I have found but 3 cases of pulmonary embolism or thrombosis, and 1 of cardiac thrombosis. These cases do not, of course, include those cases where thrombosis was a generalized process, as it not infrequently is in truly septic cases." H. T. Brooks[3] writes me from the pathological laboratory of New York Post Graduate Hospital, that during the year 1905 "there were no records of cases of either cardiac or pulmonary thrombosis" in lobar pneumonia. I. Adler[4] writes that during 1905 (at the German Hospital, New York City) "we have had only 19 deaths. Only 8 autopsies are on record, in none of which the autopsy notes mention either cardiac or pulmonary thrombosis or embolism. In those cases that died and no autopsy was obtained, the clinical symptoms never pointed to cardiac or pulmonary thrombosis or embolism." John

[1] Personal letter, June 22, 1906.
[2] Personal letter, January 20, 1906.
[3] Personal letter, Febuary 14, 1906.
[4] Personal letter, January 18, 1906.

S. Thacher[5] states: "We have not been able to find any records of cardiac thrombosis in acute lobar pneumonia during 1905." (Presbyterian Hospital, New York City.) "The firm clots found at autopsies often in pneumonia, were not recorded as the departure from the normal and its degree are so difficult to judge of."

On the other hand, F. C. Wood[6] affirms: "Clots which are formed in the heart are easily distinguished from those formed after death, by the fact that they are light in color and largely composed of fibrin and white corpuscles. In judging of the time of formation we have to consider whether the clot is adherent to the walls of the ventricles or auricles, and whether its texture is hard or soft." William H. Welch[7] writes: "Genuine antemortem clots are not common in the hearts of patients dead of pneumonia, although they occasionally occur. The age of cardiac thrombi can be determined with some degree of probability by careful examination." And yet clinical observers, even now, do not always share these beliefs. Several to whom I have spoken or written state frankly that they believe antemortem clots in pneumonia occur many times in fatal cases, and are much to be dreaded. Henry Jackson,[8] of Boston, Massachusetts, writes: "I do think that antemortem heart clot is a frequent cause of death" in penumonia, "as suggested at times by sudden death when the general condition does not seem to warrant it."

Bond Stow states[9] "cardiac thrombosis in cases of pneumonia is a very interesting and important subject." S. S. Cohen[10] is also of that opinion, as the following shows: "I am aware that modern pathologists discard the old theories of death from antemortem clot, but admitting the alterations in the constitution of the blood and realizing the fact that the circulation in the pulmonary artery and its branches is obstructed, delayed, and in some places brought to a standstill, the mechano-biologic conditions are present for the formation of thrombi and the suddenness with which death sometimes occurs in patients whose other symptoms have given no intimation of the imminence of cardiac, vascular, or respiratory failure, or of general exhaustion, seems to point to the actuality of such occurrences. Measures to maintain the fluidity of the blood are therefore wise."

H. A. Hare[11] believes that thrombosis in croupous pneumonia "is very much more common than Osler thinks."

A. C. Morgan[12] states: "Cardiac clot is said to occur frequently in fatal cases, but whether this is the cause of death or part of the closing scene is not settled."[13] The late Austin Flint, as we know,

[5] Personal letter, May 8, 1906.
[6] Personal letter, June 9, 1906.
[7] Personal letter, June 2, 1906.
[8] Personal letter, June 5, 1906.
[9] Personal letter June 28, 1906.
[10] Jour. Amer. Med. Assoc., December 10, 1904.
[11] Personal letter, December 18, 1905.
[12] New York Med. Jour., October 13, 1906, p. 743.
[13] It should be borne in mind that acute dilatation of the heart is sometimes the cause of death in pneumonia among adults, and even among infants, in which at the autopsy no antemortem clot is found. See Medical News, June 3, 1905, p. 1032.

was a firm believer in the existence of antemortem heart clot as a frequent cause of death in pneumonia. Certainly, in view of the greatly increased amount of fibrin factors in the blood of pneumonia patients, these clinical statements are, at least, much to be relied on, and yet it is only fair to add that "venous thrombosis" is an exceedingly rare complication of pneumonia. Steiner[14] could find only 38 cases recorded, and reports "three of his own." Why then believe, it may be argued, in the frequency of cardiac thrombosis which is no more probable? How is this difference of opinion to be explained? From the pathological point of view, antemortem clots which have formed a few days preceding death, terminal clots, or those which are formed during the agony do not differ materially and always from clots which unquestionably are formed after death. In both instances they may be largely formed of red-blood globules and present simply the appearance of current jelly. Or again, they may have the aspect of chicken fat throughout a portion of the coagulum and the rest of the clot be a mixture of red blood and fibrin with a predominance of the former. In neither case are they very intimately associated with the trabeculæ of the heart, or at all attached to the heart wall with any degree of firmness. The clots are not of themselves hard, nor do they show any appreciable stratification. We do find, however, in pneumonia, and quite as often, coagula, which are almost entirely fibrinous, do adhere intimately to the heart wall, and are bound up with, and intimately attached to, heart valves. These clots may be, and usually are, distinctly firmer than the others, and now and then show separate layers which could not be formed at the same time. When these fibrinous clots are present they have commonly the print of the aortic or pulmonary cusps obviously shown upon that portion of the clot which extends into the aorta or the pulmonary artery. Sometimes, indeed, "discoid masses formed usually almost exclusively of fibrin, fill the cavities of the cusps and are moulded to their surface. To this, great importance has been attached as indicating the formation of the coagula prior to death. In fact, Poullet has endeavored to prove by experiments upon animals, that in all cases in which these masses were present the clot had been formed quite a length of time during life."[15]

These facts indicate clearly to me that such clots may be found before death. Moreover, this judgment has been experimentally confirmed, as stated, on animals during life, and if analogy has value must prove equally true as regards man. The pathologists state that this is not admissible because such clots occur in diseases

[14] Hare's Practice, 1905, p. 161; also see original paper in Johns Hopkins Hosp. Bull., 1902, p. 130.

[15] Pepper's System of Medicine, vol. iii, p. 730 and 737. Formerly, I was inclined to believe that reasonable doubt might be cast upon Poullet's experiments. At present, I am disposed to sustain their validity.

other than pneumonia, although less frequently, and when they do occur they give rise to no special signs or symptoms, and if that be true, How can it be otherwise in pneumonia?

Clinicians answer that these clots may occur in other diseases, notably in diphtheria, but not as often as in pneumonia, and when they occur, owing to the gravity of the disease, with many and alarming symptoms due to pulmonary and other structural changes and also to the profound toxemia, they are not clearly made out. Even in diphtheria, whenever fibrinous clots are found in the heart, in the great number of cases, there is a complicating pneumonia present, and this pneumonia, undoubtedly, is an additional cause of heart clot. There are, moreover, cases of pneumonia in which the grave symptoms which suddenly arise, seem to point to cardiac coagula, and the rapidly fatal termination of the disease shows it almost unerringly. The heart clot may occur during the acute stage of pneumonia, when other symptoms are grave; it may occur just after the crisis, when everything appears hopeful; and it may occur during the convalescence period, when all danger is seemingly passed.

In connection with the heart clot there usually is pulmonary thrombosis, and very exceptionally pulmonary embolism. The latter condition is likely to be present when the embolic plug has come from a vein of the lower limbs (saphenous) and been carried through the right heart.

Unfortunately, in many cases in which death has occurred rapidly or suddenly and in which it is fair to assume that heart clot is present, no autopsy is permitted. This is notably true in private practice. Again, when we have made an autopsy, we find structural changes in the cardiac muscle which to many appear the direct cause of death, and the heart clot merely a result of these changes and of no particular importance. Here, again, I am inclined to believe such statements are misleading, because the heart changes are not, in my judgment, sufficient to cause death. They are no more, probably, than what we find in other cases of pneumonia in which death has not occurred, or in instances in which the death is apparently not due to the condition of the heart, if we can fairly estimate the condition of lungs, kidneys, and nervous system. Likewise, in other acute diseases, and notably typhoid fever, the intramuscular heart changes are greater than in pneumonia and do not cause death so often as it occurs from the heart in pneumonia. I am convinced that in a healthy individual attacked with pneumonia, without previous heart or kidney disorder, the heart will usually hold out sufficiently to preserve life during the acute stage and later, if the blood is kept as far as possible in a condition approximating the normal, namely, if the chlorides are properly replenished and saline beverages taken in such quantity as to keep up diuresis. (Todd.)

Cohen,[16] also argues that "the disturbance in chloride excretion seems to point to the wisdom of increasing the sodium chloride content of the blood."

H. S. Carter, on the other hand, thinks that the role the chlorides in the blood play is small, but fully believes that anything to promote diuresis by large quantities of fluids, saline or otherwise, by mouth, bowel, or hypodermoclysis "is of the greatest value." "We thought," writes Carter, "at first that as some of the cases showed rather an increase of chlorides in the blood, we might be able to graduate the percentage of saline solutions given, with a view to bring about a normal average, but as the percentage of blood chlorides, even in the severe cases did not average high, that idea was of little value. What a large series might show I cannot say. However, of 16 cases, 12 were fatal, so that they should have shown it more regularly, if it were always or even usually an accompaniment of a serious or fatal infection. I think, to be on the safe side, in severe cases I should depend much more on the diuretic effect of the fluid itself rather than the percentage of saline in it, and I would give a saline solution of rather less than that which is isotonic with normal blood, 0.9 per cent. I do feel that the nitrogenous products are much the most important to combat, of chemical constituents; that is shown well by this small series depending more on the amount of lung involvement than the apparent severity of the infection. The toxemia, of course, is always better for dilution, not, however, by intravenous use of the saline, so much as by the other more natural routes."[17]

Of course, if simple endocarditis be present, we could have a condition which would render clotting probable, even though the blood be in relatively good condition. Fortunately, simple acute endocarditis in pneumonia is infrequent. On the other hand, when it occurs, it does so comparatively early, and unfortunately "the diagnosis is always difficult and often impossible."[18]

To have a good physiological basis for any remedial practice which appeals to us, is always desirable if we can obtain it. In the question of heart clot in pneumonia, I have found nothing which in this direction is more than doubtful, but that much at least permits honest empirical trials. "It is not believed that there is a normal definite chemical in the blood which prevents clotting in the vessels in the normal state. The present view is that the "fibrin ferment" is formed first when blood comes in contact with anything except the lining of the vessels, and that perhaps even the formation of said ferment is due to something else, which is formed first, probably, out of disintegrating blood plates, or leukocytes, or both. Once formed thus, the ferment converts a proteid of the blood plasma, fibrinogen, into fibrin." Why, inasmuch as blood plates and leu-

[16] Jour. Amer. Med. Assoc., December 10, 1904.
[17] Personal letter, September 25, 1906.
[18] Edward F. Wells, Jour. Amer. Med. Assoc., October 18, 1902.

kocytes disintegrate "in the system" in health, they do not, by liberating ferment, cause clotting—nobody knows. Whatever they give rise to may be at once consumed by the cells of the vascular wall, or these cells, or some cells, may give out something unknown which may neutralize the nascent ferment."[19] From a pathological point of view we have to do less with mere conjecture.

Intense reaction in pneumonia consists of cellular metabolism, which tends to reduce the alkalinity of the blood. The reduction of alkaline salts in the blood brings a tendency to precipitation of fibrin, and increase of toxins entails cardiac arrest. With the continuance of pneumonia the alkaline salts are more and more reduced and are not replaced by the ordinary restricted dietary, hence the vital defences are continuously diminished, and finally life cases.

When a proper specific gravity and alkalinity of the blood are maintained, the crisis of the disease is precipitated by the continuance of a high temperature which tends to destroy the pneumococcus. With this view of biology, Todd[20] first treated pneumonia patients with salines. The views of Todd are also held essentially by F. P. Henry, and by Cohen. The latter believes in them particularly, because he thinks that the pneumotoxin creates a marked tendency to "coagulative processes." Todd prescribes from the inception of the disease 2½ grains of sodium chloride and 1 grain of potassium bicarbonate to an ounce of water, and 6 to 8 ounces of this fluid should be taken every two hours. The addition of lemon juice makes the drink more palatable. The character and quantity of the urine is the best test of the efficacy of the treatment. If in large quantity and light, it shows the specific gravity of the blood is normal; a different condition of the urine, viz., when high colored and in small quantity, indicates that more alkaline drink should be taken.

John B. Todd[21] writes: "My experience this past winter has confirmed my belief in the usefulness of the saline beverages in pneumonia. I believe the early and continuous use of salines does prevent, in a measure, the tendency to fibrin formation; it washes out the toxin and keeps the blood and tissue serum to maximum quantity, and in that way favors the leukocytosis, and at the same time the diuresis tends to temperature reduction." J. Madison Taylor,[22] in the "Symposium on Pneumonia" before the Medical Association of the Greater City of New York, December 11, 1905, practically endorsed the views of Todd. I commend it as a further and valuable contribution to "the role of saline solution in the treatment of pneumonia."

It is probable that the addition of lemon juice to the saline beverages is really useful in view of the researches of Professor Wright, who has found that the giving of citric acid decalcifies the blood and thus

[19] Personal letter from John G. Curtis, March 8, 1906.
[20] New York Med. Jour., March 20, 1905, p. 1004.
[21] Personal letter, April 17, 1906.
[22] Medical Record, January 13, 1906.

lessens its tendency to coagulation. According to W. Haward, C. J. N. Longridge has made similar observations. Haward[23] thinks, therefore, that citric acid should certainly be given as a curative measure when thrombosis has occurred, and also as a preventive agent in all those instances in which this complication is likely to occur. Wright[24] and Haward[25] believe that 20 to 40 grains of sodium citrate to every pint of milk is indicated, because it produces a partial decalcification of the milk and thus restricts the intake of lime salts. It also renders the milk more digestible. This it does by lessening the amount and density of the curd.[25] A similar amount of citrate of sodium may be added to every pint of saline solution when administered by the rectum. If increase of coagulability of the blood depends upon excess of lime salts in the blood, and not upon the increase in the albuminous elements of the fibrin, Wright's[27] view appears eminently reasonable. We know, indeed, that "cows' milk contains 1 part in 600 of CaO as compared with 1 part in 800 contained in lime-water."

In view of the foregoing it seems that we should give citric acid in the form of lemon juice, properly diluted and slightly sweetened,[28] far more frequently than we do at present, not merely as an agreeable, refrigerant drink, but also for its notable action in preventing coagulability, whenever there is reason to anticipate or dread it, and this is especially true in all cases of pneumonia.

On the other hand, Augustus Wadsworth[29] writes: "The calcium salts are only part of the subtle equilibrium by which the coagulability of the blood is controlled. Furthermore, the relationship of the coagulability of the blood to the infection and the immunity of the patient, is a field of research not yet explored with any practical results. The French observers, Gilbert and Fournier, "consider the fibrinogenesis in pneumonia, in some subtle way, an all-important factor in bringing about the recovery from the infection. These observers might, therefore, question the advisability of using citrate infusions[30] in the great majority of the cases."

[23] Lancet, March 17, 1906, p. 741.

[24] Medico-Chirug. Trans., 1903, vol. lxxxvi. [25] Loc. cit.

[26] Wynn, Birmingham Med. Review, April, 1906. Poynton and Shaw, Archives of Pediatrics, March, 1906, also corroborate this view.

[27] Wright has suggested, also, that a possible cause for the frequency of phlebitis as a complication of typhoid fever lies in the increased coagulability of the blood caused by cows milk. Therap. Gaz., May 15, 1906, p. 315.

[28] Sugar is stated to prevent coagulation. Vide Article Coeur, Dict. de Med., vol. viii.

[29] Personal letter, July 26, 1906.

[30] This letter of Wadsworth was in reply to my asking whether it would not be desirable, in certain urgent cases, to add citrate of sodium to the ordinary saline venous infusions. I had in mind, also, other conditions in which cardiac thrombosis might occur—notably diphtheria, typhoid fever, and following profound surgical shock from accident or operation I recognise in this latter condition, with B. H. Caswell Boston Med. and Surg. Jour., June 28, 1906, that salt solution, when alone, given intravenously, is of little or no benefit as it does not raise the blood pressure. To effect this, adrenalin is the only drug to be used. The proportions of adrenalin are: 1 to 1000 solution, one part in 200,000 (?) parts of saline solution or 1 dram to the pint. (Hare.) I am glad to note that H. A. Hare holds the same views as Caswell. Vide Practice of Medicine.

The tendency to coagulability of the blood is also diminished, as we know, by oxygen inhalations, alcohol, and diminution in the quantity of food taken. As regards oxygen, we may say "the better the oxygenation of the blood, the more easily it circulates . . . Moreover, the more thoroughly the blood is oxygenated, the less prone is it to coagulation. It has been proved that the inhalation of oxygen gas diminishes the coagulability of the blood."[31]

As the result of Bence's observations, in a large number of cases, he finds that "the viscosity of the blood rises and falls with the quantity of carbonic acid which it contains. . . . By reason of this increased viscosity, blood overloaded with carbonic acid naturally exerts its effect on the heart. If the overloading is the result of cardiac insufficiency, the latter defect will be further increased. In suitable cases, inhalations of oxygen will reduce the viscosity of the blood which contains abnormal quantities of carbonic acid, by favoring the elimination of the latter, and in this manner the cardiac insufficiency may likewise be relieved."[32]

We all know the views of Benjamin Ward Richardson with respect to the effect produced by giving ammonia internally. He states that it made coagulability feeble and slow and also made the blood globules irregular. Bartholow has, also, the belief that ammonia has considerable value in preventing and curing cardiac thrombosis.[33] In a letter from Paul Bartholow, April 15, 1906, he writes me as follows: "My father had had a great deal of experience with the effects of ammonia in those cases where the blood serum was altered by those rather indefinite bodies which we now believe factors in the phenomena of agglutination. In practice, I have twice recently seen good effects from the aromatic spirit of ammonia, which by the way has been recommended by Osler."[34]

S. S. Cohen,[35] also, states: "Ammonium, too, is known to oppose the deposit of fibrin. In the absence of an efficient antitoxin, the old empiric use of ammonium chloride and ammonium carbonate and the modern use of saline infusion seem to have their philosophical justification."[36]

[31] Haward, loc. cit., p. 744.

[32] Med. Record, February 24, 1906, p 305; also, Zeit f. klin. Med., vol. lviii, No. 3. Article by J. Bence.

[33] Therapeutics, twelfth edition, p. 237.

[34] See the chapter on Heart Disease in his Practice.

[35] Jour. Amer. Med Assoc., December 10, 1904.

[36] Flint writes as follows: "I have for several years advised the carbonate or muriate of ammonia during the progress of the disease, with a view to prevent cardiac thrombosis. Of course it is difficult to obtain clinical proof of the protective efficacy of this or any other remedy against that accident. There can be no objection to the use of this remedy on therapeutical grounds, since it does not in any manner affect unfavorably the progress of the disease. A. Patton, of Indiana, in a paper advocating the free use of this remedy throughout the disease, that is from 5 to 10 grains every three hours, states that of 96 cases in which this constituted all the medical treatment, in only 2 cases was the disease fatal. AMER. JOUR. MED. SCI., October, 1870. Of 207 cases treated chiefly with this remedy, by J. P. Thomas, only 3 were fatal. (Vide Va Med Monthly, April, 1880.) "It is probable that digitalis given with a view to increase the power of the heart's action is useful in preventing heart clot." (Flint.)

On the other hand, W. H. Howell, of Johns Hopkins University, writes to me March 26, 1906, as follows: "In regard to the action of ammonia, I do not recall that anyone has seriously believed that ammonia can effect the clotting of the blood, since the old experiments of Richardson in 1856. Richardson abandoned his theory, I believe; certainly it has long since dropped out of physiology."

In a paper read before the Climatological Association,[37] June 4, 1904, I wrote as follows: "I am of the opinion that there is weighty evidence to prove that the solution of ammonia is a preparation, used moderately and continuously in pneumonia, of considerable value. Its value is specially shown not as a stimulant, because in that particular I believe alcohol, as whiskey or brandy, to be more desirable, but to keep the blood alkaline and fluid. In this disease, especially in the grave forms and where there is extensive pulmonary consolidation, it is to my mind a very important matter. I have seen many patients in whom, before death and at the autopsy, I have been convinced that heart clot avoided would possibly or probably have meant a life saved. To no one as much as to Benjamin Ward Richardson is the honor due of great insistence upon this important fact, too much ignored today in medical writings and medical practice.[38]

"In some instances where there was distention of the right heart and jugulars, with great breathlessness, pallor, or almost lividity of lips, face, extremities, and even portions of the trunk, which means *beginning thrombosis*, I have seen temporary good effects produced by a venesection, and occasionally, perhaps, a life saved.

"But many times reducing the bulk of blood will not save life unless we dilute it, and incidentally, perhaps, partially neutralize its contained toxins. Give, therefore, a moderate saline infusion after the venesection, with this hope, and also insist upon beginning immediately or continuing frequently the use of ammonia under form of the strong solution or the aromatic spirit."[39]

Finally, I would cite from a paper of mine read before the Association of American Physicians, in 1894: "In one instance which I saw with J. E. Traub, of New York, and in which we bled the patient about 17 or 18 ounces at the third day of the disease, we had at first notable relief to the breathing and circulation, but soon the symptoms of distress and restlessness came back in aggravated form, and the patient grew suddenly worse and died. In this case no murmur could be heard in the cardiac region, and although the

[37] AMER. JOUR. MED. SCI., December, 1904.

[38] I am glad to say that the late Austin Flint shared my views. Vide Practice, sixth edition p. 172.

[39] The views here expressed are more affirmative than those I stated in an article entitled "Cardiac Thrombosis" which I wrote for Pepper's System of Medicine, in 1885, vol. iii, pp. 745 and 746. In this article, indeed, H. A. Hare, personal letter, December 18, 1905, finds a statement indicating that I have little faith in this means of preventing this occurrence. Later and wider experience has evidently changed my views considerably.

sounds were slightly muffled and the action extremely rapid, we only suspected the formation of heart clot, without being able to affirm it. In view of the sudden death of the patient and without other sufficient causes satisfactory to explain it, I now believe cardiac thrombosis was the immediate cause. I have not infrequently, especially in former years, and when I was a hospital interne, seen many autopsies in which pneumonia undoubtedly occasioned the heart clot which was the direct cause of death."

In those cases in which cardiac thrombosis is threatened, nitroglycerin is frequently advised. If there be high arterial tension associated with a rapid-acting heart, which is extremely rare, this is good counsel. If there is evident vasomotor weakness and cardiac failure is suspected, I agree with Le Fevre[40] in strongly condemning the tendency of resorting to it, as "peripheral resistance is already too low on the arterial side, and nitroglycerin only makes it lower."

Ewart writes[41] emphatically that he opposes the use of calcium salts "in a disease" (pneumonia) "so prone to clottings that one of its common fatal terminations is intracardiac thrombosis" (p. 778). Further, he strongly advocates a defibrinating treatment to forestall consolidation. He regards "clotting in the alveoli" as "the danger special to pneumonia." The aim, writes Ewart, should be at an *early date* "to maintain in the congested areas as much fluidity of blood and lymph as possible, to prevent vascular and lymphatic obstruction, and thereby to promote a *steady rate of elimination of the infecting agents and of their toxins*, thus avoiding or lessening the possible disaster consequent upon their concentration." Ewart advises the *use of leeches*, "of withholding fibrin formers from the fever diet, and of administering the citrate and the iodide of potassium to reduce the viscosity of the blood."

In conclusion, I would affirm:

1. Heart clot as an immediate cause of death in pneumonia is more frequent than postmortem investigations, as now made, apparently sustain.

2. Clinical experience seems to justify the statement that the carbonate of ammonium has probably considerable efficacy, when properly given, in preventing heart clot.

[40] Some Problems in the Treatment of Pneumonia. Med. Record, February 24, 1906.

[41] "On the Use of Calcium Salts as Cardiac Tonics in Pneumonia and Heart Disease." London Lancet, March 30, 1907, pp. 778 and 779.

THE INTERPRETATION OF X-RAY PICTURES AS AN AID TO THE EARLY DIAGNOSIS OF THORACIC ANEURYSM.

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Of all the accusing ghosts of the medical conscience, aneurysm claims a place well toward the front rank. This stricture is based upon the evidence that: (1) The condition is frequent;[1] (2) the diagnosis is seldom made until the disease is practically unmanageable; (3) the condition is preventable; (4) it is curable; and (5) the chance of cure diminishes very fast as the size of the tumor increases.

Even in this day of diagnostic dexterity it is not an uncommon occurrence for medical men, who may be admirably skilled in most directions, to carry on their visiting lists patients who are steadily going to ground with unrecognized aneurysm. The cough excited by the condition is not infrequently misinterpreted, and practitioners in Colorado sometimes find such patients to have been sent hither because of a supposed affection of the lungs.

It is not intended to give here a *resume* of the symptomatology of aneurysm. No one can deny that the student whose conception of the condition is founded solely upon the classical description of the disorder will rarely make a correct diagnosis until the anomaly has reached proportions which menace life itself.

Professor Osler[2] has recently summarized his vast experience in this field and fixed upon the subjective symptom of pain as the earliest common manifestation of aneurysm. We venture to follow the chain of events a little farther back and fix upon the signs of local increased intrathoracic pressure as the earliest recognizable evidence of aneurysm. This pressure may cause no abnormal sensation; it may be manifested only by unusual dyspnœa with muscular exertion; it often, by partial occlusion of a bronchus, diminishes the intensity of voice and breath sounds in a lobe of the lung without

[1] According to the United States Census Bulletin, the number of deaths from aneurysm in the United States in 1900 was 754, being 0.8 in 1000 deaths. In 1890 the rate per 1000 was 0.6. The only vital statistics of Denver which are definitely appropriate to this subject are recorded for the years 1895 to 1898, inclusive. During this period there were noted 13 deaths from aneurysm, including 1 from "aortic disease." This gives a ratio of over 1.86 deaths from aneurysm to 1000 deaths from all causes in Denver for the four years. Whether this larger proportion is due to greater diagnostic acumen on the part of our medical fraternity, or to climatic conditions, or to habits which superinduce the pathological state, is not clear. It seems probable that the number of deaths ascribed to aortic aneurysm is everywhere below the truth.

[2] Medical Chronicle, Abst. in Med. Rev. of Reviews, Oct. 25, 1906.

modification of percussion resonance; it so commonly irritates laryngeal nerve branches that any interference with the normal mobility of the vocal cords, or even a cough which is not explainable by obvious causes, should lead at once to the suspicion of unphysiological intrathoracic pressure.

From the considerable list of causes that may lead to such abnormal pressure, the selection of aneurysm can only be made after further analysis. It cannot be too impressively stated that aortic aneurysms of considerable size may be completely latent as regards the production of signs and symptoms which are usually held to be necessary for diagnosis. And yet we venture to assert that should the medical observer bring into this field but a fraction of the technique, judgment, and intuition he employs in the study of abdominal disorders, aneurysms would usually be discovered in their incipiency.

The first essential to the early diagnosis of aortic dilatation is a psychological state. The observer must never forget the possibility of aneurysm being a cause of symptoms emanating from the chest; and when there is a suspicion of syphilis in the history of the patient, we believe with Saathoff[3] that rigid inquiry should be instituted to exclude arterial degeneration. It is rare indeed that the patient, seen early in his disease, presents signs of aneurysm distinctive from those of pressure that may be caused by a solid tumor mass. The Röntgen rays, the skiagram, which should be tested by the fluoroscopic findings, should be directed to every case of doubtful nature. But to the beginner in the study of Röntgen pictures the chances of error in diagnosis are thereby profoundly increased. The interpretation of such images by the untrained eye is about as reliable as would be inferences founded on the sounds heard through a stethoscope by an untrained ear. Sailer and Pfahler,[4] in a valuable contribution, say, "The investigators who employed the fluoroscope or skiagrams for the purpose of studying changes in the aorta were early impressed with the fact that, although aneurysm was occasionally overlooked, it was more frequently diagnosticated when it did not exist."

The chief inherent difficulty in the interpretation of the skiagram probably depends upon the fact that the shadows give little or no perception of depth. The observer must learn to draw inferences from two dimensions only without artificial device to simulate perspective. Probably every clinician who has sought the aid of the Röntgen rays in his diagnosis can recall examples of errors of judgment immeasurably increased by misinterpretation of the pictures. Such an instance has already been reported by one of us.[5] It may

[3] Das Aorten-aneurysma auf syphilitischer Gründlage und seine Frühdiagnose. Münch. med. Woch., liii, Nr. 42. Abst. in Jour. Amer. Med. Assoc., 1906, 46, 2129.

[4] Tortuosity of the Aorta, AMER. JOUR. MED. SCI., Oct., 1903.

[5] Sewall, An Extraordinary Case of Anthracosis Simulating Aortic Aneurysm, AMER. JOUR. MED. SCI., Jan., 1906.

be useful to recount another case or two occurring in the practice of the same observer:

CASE I.—A man, aged thirty-seven years, a smelter hand, for the last two months of his active life was employed in a smelter for mercurial ores. He positively denied venereal infection. His height was considerably over 6 feet, and his weight in health 240 pounds. Signs of slight mercurialization appeared while in his last position; his physician declared that mercury had settled in his liver and caused enlargement. His complaint was of extreme weakness. Feet and legs became swollen, and he suffered from shortness of breath. He manifested orthopnœa for two months previous to entering the Denver County Hospital, October, 1904. He had lost about 20 to 40 pounds in weight in six months. On examination the patient appeared to be in good general condition; his only complaint was of dyspnœa, especially marked with exertion. There were the physical signs of double hydrothorax, the effusion being larger on the left side. The heart sounds were practically normal, but very faint and distant. There was no "Broadbent sign" of pericardial adhesion. Each pleural cavity was tapped at intervals and clear serum was withdrawn; not more than about one quart could be obtained at one sitting. The negative character of the patient's history and the lack of positive disorder in his heart and kidneys made him a subject of especial interest. It was concluded that his hydrothorax depended upon pressure on veins entering the heart and that the cause of obstruction was probably a mediastinal growth. On one occasion a trocar, inserted into the chest near the left posterior axillary line, about an inch above the angle of the scapula, when it had penetrated less than three inches struck against what was apparently a hard, solid object. Here, then, there appeared to be proof positive of a new-growth within the chest. The patient was well enough to go to the office of Dr. G. H. Stover, one of the radiographers to the hospital, for *x*-ray examination. The skiagram showed a dark shadow rising from the surface of the fluid remaining in the left pleural cavity, apparently just in the situation it should have occupied if caused by a mass as located by the trocar. The diagnosis of a solid growth, probably of mediastinal sarcoma, was now considered settled. In the course of two or three months the patient died under other medical care, and an autopsy was obtained. The postmortem examination failed to reveal anything in the nature of a tumor. The left pleura had become adherent throughout and had a thickness of about one-quarter inch. The "solid body" struck by the trocar during attempt at paracentesis was undoubtedly the sheet of pleura which had been pushed before the point of the instrument until its resistance became palpable. The pericardium was very thick and densely adherent all over the heart. The clinical history and the fatal ending are easily explained by the postmortem findings.

CASE II.—A man, twenty-eight years of age, came to Denver on account of faintly marked tuberculous infiltration at the apices of his lungs. Syphilis was denied. After a sojourn of a month it was evident that a fresh invasion of the pleura covering the upper lobe of the left lung had occurred, the morbid signs being especially marked along the left sternal border. At the same time a pulsation synchronous with the heart beat, and having an outward systolic excursion, appeared in the first left intercostal space within an inch of the sternum; there also developed a slight but distinct tracheal tug. A skiagram of the patient's chest, the plate having been placed on the back, showed a well-marked shadow above the heart, left of the vertebral column, as if made by a considerable dilatation of the descending aorta. Seen through the fluoroscope, the outlines of the shadow pulsated with the heart beat. The dimensions of the image were considerably less in a skiagram obtained with the sensitive plate situated on the front of the chest; the object in question was, therefore, nearer the anterior than the posterior wall of the thorax. When the abnormal shadow was viewed through the fluoroscope it diminished in diameter and practically disappeared when the patient, in the upright position, turned his body so that the rays penetrating the thorax should cut at a certain angle the anteroposterior plane. The interpretation of the shadow then became clear; it was simply due to the opacity of the pleura of the left lung, seen in optical section, bounding the anterior mediastinum. When the incident rays fell obliquely upon the sheet of thickened tissue the shadow was broad; when the rays were parallel to the membrane the shadow narrowed. The various pulsations and the tracheal twitch were also easily explained as the result of pleuropericardial adhesions.[6]

Lest the use of the Röntgen rays should seem to introduce more difficulties in diagnosis than it dissolves, it may be well to cite two more cases in which the radiographic pictures proved of vital therapeutic assistance:

CASE III.—A gentleman, aged forty-seven years, who had had syphilis in his youth, was an active business man, carrying great responsibilities. His weight was about 240 pounds, his musculature rather flabby. He smoked to excess and took several drinks of strong spirits after office hours. He developed a dry, hacking cough, which was exaggerated with excitement or exertion. Physical examination of the patient revealed nothing noteworthy, except a diminution in the intensity of the respiratory murmur, voice sounds, and tactile fremitus at the left apex, while the percussion resonance was unchanged. An x-ray picture of the chest revealed

[6] In an essay by one of us (Sewall, Some Conditions Other than Aortic Aneurysm which Determine the Occurrence of the Tracheal Tug, Trans. Assoc. Amer. Phys., 1901, xvi) it was pointed out that pleural adhesions of the left apex were prone to give rise to a slight "tracheal tug." The case cited above would indicate that adhesions involving the mediastinal pleuræ would tend to produce the same phenomenon.

a slight but obvious bulging of the aortic arch upward and to each side. The patient was cut off from his liquor, his indulgence in tobacco was limited, his physical exertions were greatly reduced, his diet was lightened, and iodides were administered in small doses. In a few days improvement was manifest and before long all morbid symptoms disappeared. Another *x*-ray picture taken some eight months after the first showed a much more normal aortic shadow.

CASE IV.—A lady, aged fifty-five years, suffering from chronic pulmonary tuberculosis marked by very slight infiltration of the left apex, but by a dry cavity at the right apex, suddenly developed a dry, spasmodic cough and hoarseness with use of the voice, and there appeared a marked pulsation, synchronous with the heart beat, in the first left costal interspace, about one inch from the sternum, and in this area there was a marked systolic bruit. The larynx was normal except that the left vocal cord was found partially paralyzed and in nearly the cadaveric position. This patient gave a history of having had five miscarriages. Moreover, for ten days preceding the sudden development of the symptoms described she had rested, for a purpose that need not be described here, with the foot of her bed elevated about seven inches above the floor. The skiagram showed slight globular enlargement of the extremity of the aortic arch with extension upward, a condition which without the clinical symptoms could readily be ascribed to simple "tortuosity" of the aorta. But when we consider the suspicion of luetic infection aroused by the history of five miscarriages there is ground for assuming arterial degeneration. Again, Stephens[7] has found that the maximal arterial blood pressure is very much increased in the "head down" position. In a study of 22 healthy young men Dr. Stephens found the means of his estimation of blood pressure, measured in the left arm, to be, standing, 130 mm. Hg.; sitting, 130; supine, 148.3; head down (body at an angle of 45 degrees) 165; right lateral, 114; left lateral, 156; It is not now necessary to consider the discrepancies between these results and those found by other observers, notably by Erlanger and Hooker[8] in their admirable treatise.

If Stephens' conclusions be true, we have an explanation of the sudden development of pressure symptoms; for nothing is more common in the history of aortic aneurysm than the sudden development of symptoms following exertions that raise arterial pressure. Moreover, the skiagram of this patient showed a marked enlargement and density of the bronchial glands, the presence of which could easily have opposed to the aorta a counter-resistance capable of

[7] Blood Pressure and Pulse Rate as Influenced by Different Positions of the Body, Jour. Amer. Med. Assoc., Oct. 1, 1904.

[8] An Experimental Study of Blood Pressure and of Pulse Pressure in Man, Johns Hopkins Hospital Reports, vol. xii, 1904.

generating pressure symptoms which would otherwise be wanting.[9] It may be said that during a rest in bed for nearly five months all symptoms attributable to aneurysm gradually disappeared.

When it was first discovered that the body could be made transparent, the Röntgen rays were supposed, necessarily, to offer a plain revelation of every anatomical secret. When it was found that mistakes in diagnosis might be multiplied and intensified by the general application of the method, there was a widespread reaction of discouragement as to its value. There is evidently still need of general information as to the limitations and conditions of usefulness of the *x*-rays in diagnosis.

We have been so strongly impressed with the difficulties of correctly interpreting the shadows of the thoracic skiagram that we venture to believe that a categorical summarization of the elements of confusion that have developed in our experience may be of service to beginners in this important field of diagnosis, when the *x*-rays are employed to ascertain whether thoracic aneurysm exists. Our conclusions are similar to those of Baetjer,[10] whose valuable paper was not seen until our work was finished:

1. In the study of fluoroscopic and skiagraphic pictures the beginner is apt to forget the fundamental importance of centring the rays and maintaining them as nearly as possible perpendicular to the plate or screen. Even when anode and screen or plate are so far separated that the incident rays are approximately parallel, a slight inclination of the receiving surface distorts the outline of the image, just as an object on the ground throws a distorted shadow in the light of the setting sun. No proper comparison can be made of the opposite borders of a Röntgen shadow unless the corresponding rays fall upon the sensitive plate at the same angle. Very gross errors as to the size and shape of the objects within the chest, as, for example, the mediastinal pleura or the arch of the aorta, may arise from failure to dwell upon this physical fact.

In a skiagram obtained with the central rays perpendicular to the chest at the lower border of the manubrium, the plate being at the back of the subject and the tube at least twenty inches from the plate, the top of the normal aortic arch should appear to be about opposite the fourth costal interspace behind.

2. It must never be forgotten that the *x*-ray picture usually

[9] One of us has notes on two other cases, one having come to autopsy, in which extraordinary clinical symptoms, notably paroxysmal vomiting, seem properly to be ascribed to irritation of vagus nerve branches pinched between an intermittently dilated aorta and a much enlarged bronchial gland. Dr. Robert Levy, of Denver, whose laryngological observation of tuberculous persons has been very extensive, in a personal communication states that some five or six cases of laryngeal paralysis, due apparently to pressure upon a recurrent laryngeal nerve, have come under his care. The disorder usually involves the left vocal cord. In two patients, at least, the function has been restored. The paralysis was ascribed to the pressure of enlarged bronchial glands; such bodies were prominent in skiagrams taken in two cases.

[10] X-rays in the Diagnosis of Aortic Aneurysms, Johns Hopkins Hosp. Bull., January, 1906.

forms but one link in the diagnostic chain. The significance of the skiagraphic findings can often only be inferred after careful consideration of the clinical history, signs, and symptoms furnished by the patient. A wide range of anomalies of the thoracic aorta and its branches is to be found in the literature. Moreover, a condition well described by Sailer and Pfahler as "Tortuosity of the Aorta" is so commonly found in healthy subjects, as well as those manifesting vascular senile changes, that it must always be eliminated in considering the significance of a broadened shadow of the aortic arch. These authors point out that, especially in atheromatous subjects, the aortic arch may be elongated and its unsupported parts may be considerably displaced, as is so frequently seen in the peripheral arteries in conditions affecting their elasticity. The clinical determination of atheroma of the aorta is not without difficulty.

As pointed out by Klotz,[11] arteriosclerosis is apt to invade by preference vessels in the parts which are most used. It has been held that hypertrophy of the heart accompanies sclerosis of the aorta, but not sclerosis which involves peripheral arteries alone. The "tortuosity" of the aorta gives a skiagraphic picture which might easily be mistaken for aneurysm. But, owing to the topographical relations of the aorta, it is more common for the bulge in the shadow to occur to the left, at the descending part of the arch, than to the right. But, unless there is a true dilatation of the vessel, the image of the transverse portion of the arch is not likely to rise above its normal position. Our own experience has been chiefly with younger subjects than those studied by Sailer and Pfahler, but it confirms their contention that spurious bulging of the aortic shadow, particularly at the descending part of the arch, is a common phenomenon, and that it is especially likely to be found where arterial elasticity is diminished. We have not tested the matter thoroughly, but we venture to think that the fluoroscopic study of the patient while, in the sitting position, he turns round a vertical axis, should aid in the discrimination of elongation from dilatation of the aorta; with mere elongation of the artery the bulging of the arch should diminish when the rays become more nearly parallel to the plane of the arch. The conditions of the observation are, however, rather complex, and each case must be judged by itself. In our experience, bulging of the shadow to the right of the vertebral column is much more indicative of a pathological condition than an extension to the left. Extension of the aortic shadow upward, especially if associated with a bulge to the right, is very suspicious of a pathological condition.

3. Dilatations of the aortic arch, particularly in its ascending limb, are of frequent occurrence and must always be discounted in

[11] The Relations of Experimental Arterial Disease in Animals to Arteriosclerosis in Man, Jour. Exper. Med., Aug. 1, 1906, p. 504.

the subjects of atheromatous vessels. It is of the highest importance, from a clinical point of view, to determine whether such dilatations are potential aneurysms. In our opinion, a history of syphilis in such a patient is sufficient ground to justify the medical observer in instituting treatment appropriate to the cure of aneurysm, as already advised by Saathof. Nevertheless, here, too, physical and circumstantial evidences may apparently conspire in leading the observer to wrong conclusions, as witnessed by the following case:

CASE V.—Mr. G., aged twenty-six years, twelve years ago contracted syphilis, for which he was treated for about two years. He has had pulmonary tuberculosis about five years. For three years he has suffered much from chilly feelings in springtime. No history of malaria. Physical examination: Weight, 117 pounds. Wheezing rales throughout lungs, especially in right upper lobe, where there are obscure cavernous signs above and below clavicle. Air enters lower right lobe poorly. The apex beat is in fifth space under the nipple, but also faintly felt in sixth space, parasternal line. The area of "aortic dulness" is much enlarged, including the upper sternum and an area more than an inch broad on each side of it. The aortic second sound is somewhat accentuated. There is a slight tracheal tug. In the second right interspace, under the middle of the clavicle and to the right of the aortic dulness, is a pulsation outward in systole, both palpable and visible. In the second left interspace, close to the sternal margin, is a very small area of pulsation inward at systole. The veins of upper extremities are somewhat prominent, especially those of right arm and upper right chest. The abdominal veins are prominent in the erect position. There is noticeable epigastric pulsation, which is outward in systole on left border of epigastrium. There is very slight outward systolic heave of upper right chest. Lying supine, there is considerable pulsation above the clavicle, but nothing can be felt. There are no bruits; the radial arteries are slightly thickened. The pupils are equal and the pulses of even volume. There is no chest pain or significant cough.

When viewed by the Röntgen rays this man's chest presented typical difficulties in interpretation. The aortic arch was slightly higher than usual, and there was a perceptible outward bulge to its descending portion. Opposite this point, in a position corresponding to the ascending aorta, the shadow broadened in exact imitation of a dilatation of the artery. A dense band of tissue passed from the heart base, tangent to the apparent aortic shadow, upward and outward, to be lost in the apex of the right lung. Through the fluoroscope this band was seen to have a plain respiratory excursion, and it bounded the lower border of a small tuberculous cavity under the right clavicle. The pulsation in the second right interspace probably had its origin in adhesions of this band. Two skiagrams

and a fluoroscopic study of these relations convinced us that the apparent dilatation of the ascending aorta, in spite of the clinical signs suggesting it, was spurious and due to tuberculous infiltration and distortion of the right mediastinal pleura and adjacent structures. Incidentally, the skiagram revealed a well-developed cervical rib on the right and a rudimentary one on the left of the patient's neck.

When repeated skiagraphic studies of a doubtful case through long intervals of time becomes a routine practice, disaster to patients from the insidious development of arterial degeneration will doubtless often be averted.

4. Relatively little notice is given by technical writers on this subject to confusion arising from the configuration of the bronchi and pulmonary bloodvessels. The shadows of these channels are often lost in the development of the plate. In a skiagram taken as described above, the bronchial tree and pulmonary artery in each lung are commonly represented by a single, short, horizontal trunk projecting from the spinal shadow on each side at about the level of the seventh dorsal vertebra, and dividing at a distance of about two inches from the middle line into two branches, one of which ascends parallel to the spinal column and the other descends in a direction somewhat obliquely outward.

Radiographers seem not to be in accord in the interpretation of these shadows.[12] Some take them to be the outlines of the bronchial tubes, while others hold that they represent the pulmonic arteries. Theoretically, it ought to be easy to distinguish the shadows of an air-filled tube and a blood-distended vessel; the one should increase in density toward the middle and the other on the margins. In the subjects of peribronchial sclerosis and adenitis the bronchial tree undoubtedly forms the basis for a considerable part of the figures in question. Enlargement, calcification, or pigmentation of the groups of lymph nodes at and near the bifurcation of the trachea is pretty sure to be represented in the trunk of the bronchial tree springing from the spine at the level of the seventh dorsal vertebra.

In normal lungs without undue development of connective tissue or enlargement of the lymph nodes, it is improbable that the course of the dividing bronchial tubes is to be traced in the radiogram. But it can easily be proved that figures corresponding in position to the outlines of the "bronchial tree" can be developed at will by overfilling the pulmonary bloodvessels. Our demonstration of this fact was founded upon and modified from an ingenious experiment of Professors Zuntz and Loewy and their collaborators,[13] who studied the changes in heart volume under extreme differences in the phases

[12] P. M. Hickey, The Interpretation of Radiographs of the Chest (and discussion), Trans. Amer. Röntgen Ray Society, 1905, p. 136.

[13] Hohenklima u. Bergwanderungen, 1906, S, 352.

of respiration. Our purpose was to compare the skiagrams of a normal chest taken (1) when emptied as thoroughly as possible of blood; (2) when congested as fully as might be. In the first case the subject, an adult male with spare figure and normal lungs, at the end of an ordinary expiration, closed the mouth and nostrils and then strongly contracted all the muscles of expiration during the period of exposure. In the second case the subject, at the end of an ordinary expiration, closed mouth and nose and then attempted to draw air into the lungs by contracting the muscles of inspiration. The relative anemia or congestion of the lungs was additionally furthered by taking the skiagrams with the subject supine, in the first case with the body inclined, head up, at an angle of about 12 degrees to the horizontal, and in the second case with the head down at the same inclination.

Detailed description of the pictures so obtained will be given in another place, but it is pertinent to state here that the skiagram of the congested lungs shows well-marked figures corresponding to the ramifications of the "bronchial tree" which are absent from the companion plate.

When the system of peribronchial glands is well developed, particularly if there is a condition of pneumonokoniosis, the outlines of the bronchial tree, with the attendant arteries, can lead to error, particularly through the simulation of an aneurysm of the descending aorta by the tubes supplying the lower lobes of the lung.

5. In any disorder of the lungs attended by sclerosis, as is so often witnessed in pulmonary tuberculosis, the heart is likely to be drawn far out of its normal position. We have especially noticed that displacement of the heart to the right tends to develop a perceptible tracheal tug. The shadow of the displaced heart made by the *x*-rays may lead to confusion as to the meaning of the images about it. In such cases there is likely to be a greatly thickened pleura and enlargement of the bronchial glands, which combine to broaden the shadow from the base of the heart upward.

6. A tumor of the œsophagus could with difficulty, if at all, be skiagraphically differentiated from a saccular swelling of the aorta.

7. The mediastinal glands, particularly in tuberculous subjects, are a fruitful source of error in diagnosis. Moreover, the chains of infiltrated glands in the lower thorax can easily suggest a fusiform dilatation of the descending aorta. A group of enlarged glands at the aortic arch may, according to our observations, give a massive shadow, pulsatile under the fluoroscope, which it is exceedingly difficult to differentiate from an aneurysm. The medley of enlarged glands, thickened pleura, and cirrhotic tissue enclosing pulmonary cavities may cast a shadow almost exquisite in its imitation of aneurysmal dilatation. In such cases it is usually easy to avoid error by noting the homogeneity and regular outline of the aneurysmal shadow as compared with the unequal density of surface and more or

less knobbed outline of its spurious imitation. As already hinted, clinical experience has strongly impressed us with the suspicion that the presence of enlarged glands about the aortic arch is peculiarly likely to result in the manifestation of nerve-pressure symptoms, with very slight degrees of arterial dilatation. A nerve trunk might be widely displaced by a swelling artery without provoking signs of irritation; but if the sensory cord is pinched between the vessel wall and an unyielding body, such as an enlarged, hardened gland, the slightest abnormal dilatation of the artery might be expected to provoke profound sensory disturbances. Our experence indicates that certain cases of angina pectoris and of paroxysmal vomiting may have their origin in this way.

8. Pneumonokoniosis may lead to the precipitation of dense shadows throughout nearly the whole or any part of the thoracic skiagram, and can easily be so situated as to simulate saccular aneurysms. A mistake in diagnosis made by one of us in this direction has already been referred to.

9. The thickened pleura is remarkably opaque to the Röntgen rays. It is frequently the case, especially in the subjects of pulmonary tuberculosis, that in the development of the *x*-ray plate the image of the heart is completely obliterated before the shadow formed by the obscuring pleura can be dissolved, especially when the plate is placed at the back. An actual error in diagnosis, largely due to the conformation of a thickened pleura, has already been recorded above. We have been especially impressed with the importance of the mediastinal pleuræ as occasionally giving rise to suspicion of aneurysm of the descending aorta. The apparently expansile pulsation which the heart movement may give to these membranes is very suggestive of a vascular tumor. Before drawing conclusions from the radiographic pictures in respect to these sources of error, there should be a comparison of skiagrams obtained with the sensitive plate upon the front of the chest with that made in the usual manner. By reason of the divergence of the *x*-rays a given object will appear larger and less well defined the farther it is situated from the sensitive plate and the nearer it is to the source of the rays. It is particularly serviceable to analyze the fluoroscopic image by viewing it along different radii of a horizontal plane, as can be easily accomplished when the patient, sitting upright, turns his body on a vertical axis. By this means, for example, the dense shadow thrown by a pleural membrane when penetrated obliquely by the rays may be seen to contract its borders as the sheet of tissue is viewed edgewise.

THE RELATIVE VALUE OF HIGH AND OF LOW ALTITUDE IN THE TREATMENT OF TUBERCULOSIS.[1]

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While I recognize that our ideas are more or less influenced by our surroundings, and that men who practice at high altitudes are likely to favor it in treatment, while those practising at low altitudes are likely to think it best, yet we must divorce ourselves from such influence and discuss the question in an impartial manner, if we wish to arrive at the truth. The fact that one observer sees tuberculous patients do well at a high altitude does not prove that high altitude is the most advantageous place to treat tuberculosis; nor does the fact that another observer sees tuberculous patients do well at low elevations prove that such elevations are the best for tuberculous patients. These observations simply point to the fact that some tuberculous patients do well at high, and others at low, elevations; or, as it might be stated broadly, patients suffering from tuberculosis can get well at various altitudes. It remains, then, for us to discuss impartially, if such is possible, the conditions accompanying both high and low altitude, and then attempt to suit these conditions to the patient and his disease.

A few years ago it was thought that there was a specific climate for tuberculosis. Individuals suffering from the disease were led to believe that if they could only leave home and go to one of these favored places they could be cured. And they also felt that if they were to remain at home it was almost certain death. So strongly has this idea taken hold of the people that they are led to do many foolish things. They leave home without any idea of where they are going or what they are going to do when they arrive at their destination. The thing that they have uppermost in their minds is reaching this favorable clime. All else is secondary. But the time comes when the "favored climate" is secondary, and meeting the conditions of life and adapting themselves to the climatic change is primary. These difficulties and annoyances could be largely eliminated by carefully advising patients before they leave home.

The task of choosing a climate for an individual suffering from a disease is one of great importance, for unless it is properly suited it is capable of doing harm. The idea is prevalent that anyone can make a change of climate. So they can, but it is not everyone that

[1] Read at the twenty-fourth annual meeting of the American Climatological Association, Washington, D. C., May 7, 8, and 9, 1907.

can make an intelligent change. To prescribe climate requires as much skill as to prescribe drugs. In prescribing a climate for one suffering from tuberculosis the disease and the individual both must be kept in mind.

The principles underlying climatotherapy are not so difficult, if only one stops long enough to understand them. The beneficial effect of a change upon nutrition is well known, even if the change be one only of surroundings, and not of climatic conditions. The effect of going to a less favorable climate than that in which one lives is often beneficial. How much more beneficial, then, should a change be which is carefully suited to the patient and his disease.

The primary effect of climatic treatment is upon metabolism. Its fundamental effect is upon tissue change, and its effect depends upon its powers of abstracting heat. The heat abstracting power of a climate depends upon the temperature, humidity, and the movements of the air. A cold climate, then, with much wind, makes the greatest demands upon the system for heat; a warm, humid climate, with absence of wind, should make the least. A dry, warm climate cannot be equable, because it does not hold heat well, and as soon as the sunshine ceases, or as soon as the shade is entered, the air becomes cool. The wide diurnal variation in dry climates is due to this fact.

Thus it can be seen that a climate which makes great demands for tissue change requires a hardy man to endure it. It would be unwise to send one who has low vitality, and who endures cold badly, to such a climate with the expectation of his deriving benefit from the change, for his forces could be overtaxed in supplying the normal waste incident to such rigorous conditions. On the other hand, such a patient would doubtless improve in strength and weight very materially if surrounded by such climatic conditions as would allow of the body cells keeping up the natural tissue change and still having some power in reserve to apply to the building-up of a stronger constitution. Cold climates are stimulating, while warm, humid climates are enervating. Between these we have all grades, and so, if we form a correct opinion of our patient, we can find a suitable climate for him.

It must be remembered that climatic conditions change with the seasons. Thus the climate of the Rocky Mountain regions at an altitude of 5000 feet is cold and rigorous in the winter, but temperate in the summer. Many people who might not be able to endure the winter might profitably spend the summer months there.

One suited to life in a cold rigorous climate, or at high altitude, should belong to the hardier type of men, with good circulatory, digestive, and assimilative powers. The young and robust are particularly suited to such conditions, while those in advancing years should be spared the excessive demand for tissue change.

The first point, then, that should be considered in choosing a

climate for a tuberculous patient is his ability to respond to the demand for tissue change, which will be made by such climatic change. This point must be determined upon regardless of the question as to the adaptability of high altitude to the treatment of tuberculosis.

For many years high altitude was considered to be an essential in the treatment of tuberculosis. This opinion was due largely to the statements of Dr. Archibald Smith, who wrote, in 1840, that in the Peruvian Andes immunity from tuberculosis was commonly observed at an elevation of 7500 to 8500 feet. This was very evident, because in the cities at lower altitudes and at the base of the mountains tuberculosis was rife. This same apparent immunity was noted in the Rocky Mountains and also in the Alps. The natural conclusion is that high altitude confers immunity. This was honestly believed for many years.

Other observations, however, were made, which cast some doubt upon the supposed immunity being due to the altitude per se. It was found that the Steppes of Tartary, some portions of which are below sea level, and the great desert of the Southwest in America, portions of which are also below sea level, likewise share this apparent immunity from tuberculosis. This forced the conclusion that it is not altitude per se, but certain conditions which exist in common between high altitudes and these great desert regions which causes this apparent immunity.

If we stop to inquire what these conditions are, we note that both have: (1) A sparse population; (2) a great amount of sunshine; and (3) a pure air with low bacterial content.

When we consider that these are the conditions which are favorable to the prevention of the spread of tuberculosis, we can readily explain why tuberculosis does not exist to any extent in such regions. Tuberculosis is a disease which is most rife where overcrowding exists. It is particularly a disease of cities, and especially prevalent among the poor. Sunlight is the greatest enemy of the bacilli and our most reliable prophylactic, consequently we would not expect tuberculosis to spread very rapidly in these sparsely populated districts.

The votaries of high altitudes have endeavored to explain its benefits as being due to things which are not in common with low altitudes, and they have almost invariably used the damp lowland climates in the comparison. Consequently, they claim that the value of high altitude is due to lowered atmospheric pressure, a greater diathermacy, an increased electric tension, dryness of the atmosphere, and a great amount of sunshine. Granting that these are the elements of value, they are all present, except the first, in the low altitudes possessing dryness of atmosphere; consequently, there must be some other reason assigned to their supposed superiority of high altitude or we must accept the conclusion that high altitude is not an essential to the treatment of tuberculosis.

Now let us examine the other side of the ledger and see if there are any reasons why high altitude is contra-indicated in the treatment of tuberculosis? In the first place, high altitude treatment is contrary to the principle of rest in inflammations in general and tuberculosis in particular. The accepted principle of treatment in tuberculosis is rest, and it is employed whenever possible, so it is well to stop and inquire whether or not we should make an exception in case of the lung, and, if so, why so?

That high altitude causes great activity on the part of the lungs and throws great strain on the heart which is already severely taxed is an accepted fact, and one which cannot be ignored in the discussion of this subject.

That rest is the better method of treatment of pulmonary tuberculosis is also suggested by the observation which I have made repeatedly with reference to that portion of the lung which immediately surrounds the heart. When this part becomes seriously affected, especially on the left side, where it receives the greatest impulse of the heart beat, it is very slow at healing. I believe that the proper explanation of this fact is associated with the constant motion of the part owing to the action of the heart.

Another point relative to the employment of high altitude is the condition of the patient. It seems unreasonable to place an individual who is deprived of a portion of his aërating surface under conditions where he is subjected to a natural demand for more respiratory effort, and one whose heart is undergoing an extra strain under circumstances where it will be subjected to more strain. It also seems unreasonable to place one who is suffering from the severe bodily drain incident to tuberculosis, whose vitality is lowered, whose bodily functions are interfered with, in such conditions as to be called upon for an exaggerated tissue change, such as is required to meet the demand which is made by a high altitude. This consideration calls in question the advisability of sending those who have advanced lesions to a high altitude, and suggests that if a high altitude is the best place for treating tuberculosis, only those who have slight lesions should be chosen for such treatment. Further consideration would also suggest another important limitation, that is, of early cases only those should be sent who are able to meet the extra demand made upon them by the climatic conditions found.

Another important point in the treatment of tuberculosis is the after-result. It has long been noted that patients who secure an arrestment of their trouble at high altitude must remain there afterward. It seems to me that the explanation of this might be suggested by another observation which is common to men who see many cases of tuberculosis, that is, that tuberculosis is common among athletes. It seems to me that the reason for this lies in the overstraining. Athletes are subjected to more or less constant strain. Their heart and lungs over-develop to meet the extra burden thrown upon them.

They become larger than is necessary to carry on the usual work associated with the ordinary duties of life. When they leave the athletic field and settle down to the usual routine of life, they are at a disadvantage. They have more lungs and heart than they need. Nature attempts an adjustment. A retrograde process supervenes, the organs become more or less flabby and less resistant. That this is probable we may infer from our observations on muscles which have been over-developed and those subjected to disease.

When one becomes adjusted to a high altitude the heart and lungs increase in size just as those of the athlete, and when he returns to the low altitude his heart and lungs must undergo a readjustment, a retrograde process must take place. In the case of tuberculosis it is probable that during this time the tissues are not so resistant as usual and that the patient is prone to have renewed activity in the old process.

From these observations I am led to the conclusion that tuberculosis is a disease which is best treated at low elevations.

THE RELATIONS BETWEEN DIABETES AND PREGNANCY:

WITH THE REPORT OF A CASE OF DIABETES IN WHICH THE GLYCOSURIA DISAPPEARED WITH THE INCEPTION OF PREGNANCY AND REAPPEARED AFTER DELIVERY.[1]

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Diabetes mellitus must be looked upon as the expression of a derangement of carbohydrate metabolism, resulting in the more or less constant presence of an excessive amount of sugar in the blood, and, secondarily, in the urine, together with profound nutritional disturbances. The transitory appearance of sugar in the urine is not rarely observed in conjunction with a number of other conditions, while occasionally in cases of diabetes the sugar disappears from the urine with the onset of acid intoxication and coma, and perhaps it may be absent also at other times.

Sugar has been observed so frequently in the urine of pregnant, parturient, and puerperal women that its presence has been designated physiological. H. Blot[2] found in the urine of all parturient and nursing women and in that of about half of all pregnant women

[1] Read at a meeting of the Association of American Physicians, Washington, D. C., May 7, 8, and 9, 1907.

[2] Gaz. d. hôp. civiles et milit., 1856, p. 482.

a reducing substance that he considered sugar, and he thought the phenomenon related directly to the secretion of milk.

Leconte[3] contested this view, contending that the reducing substance was not sugar, but rather uric acid. T. Kirsten,[4] on the other hand, agreed with Blot, while E. Brücke[5] maintained that normal urine almost constantly contains traces of sugar and that the urine of puerperal women may contain even larger amounts.[6]

A. Hempel[7] concludes that sugar appears in the urine of puerperal women only as the secretion of milk becomes active, and that the amount is proportionate to the degree of development of the mammary glands and the duration of the stasis of the secretion in the breasts. V. Johannovsky[8] made comparative observations on 25 healthy men and 25 nursing women and found that the urine of all of the former and of 21 of the latter (without milk stasis) reduced copper and was levorotary, while the urine of 4 nursing women with milk stasis likewise reduced copper, but was dextrorotary. He considers the latter phenomenon as evidence of a resorption lactosuria, and L. Hofmeister[9] found the reducing substance actually to be lactose.

J. Ney[10] examined the urine of 148 nursing and 24 pregnant women and found sugar present in four-fifths of the former and one-sixth of the latter. The condition was especially associated with an abundant secretion of good breast milk. G. Keim[11] found sugar in the urine of 20 among 25 nursing women and in that of but 4 among 19 pregnant women. He considered the condition physiological in the one instance and pathological in the other. Among 125 women between the seventh and ninth months of pregnancy M. Brocard[12] found sugar in the urine in 50 per cent. Glucose predominated, but milk sugar appeared as lactation was approached.

F. A. Lemaire[13] found that when sugar was present in the urine prior to labor the amount became greater after labor in consequence of the excretion of milk sugar, as well as of a greater amount of glucose and isomaltose. Milk sugar appeared in the urine of nursing women when none had been present during pregnancy.

F. Lanz[14] has found the power of assimilating carbohydrates greatly diminished in pregnant women, as shown by the presence in 19 of 30 cases from the fourth month of pregnancy onward of

[3] Compt.-rend. hebdom. des séances de l'Académie des Sciences, 1857, xliv, 1331
[4] Monatsschr. f. Geburtsh. und Frauenheilk. 1857, ix, 437.
[5] Sitzungsbericht der kaiserlichen Academie der Wissenschaften, Wien., 1858, xxviii, xxix.
[6] Wien. med. Woch., May 8, 15, 1858, 321.
[7] Archiv f. Gynäk., 1875, viii, 312.
[8] Ibid., 1877, xii, 448.
[9] Zeitschr. f. physiolog. Chemie, 1877-78, i. B, 101.
[10] Archiv f. Gynäk., 1889, xxxv, 235.
[11] Progrès médical, 1898, i, 424.
[12] Compt.-rend. hebdom. des séances et mémoires de la Société de Biologie, 1898, t. 5, 10 ser. 1077.
[13] Hoppe-Seyler's Zeitschr. f. physiolog. Chemie, 1895-96, xxi, 442.
[14] Wien. med. Presse, December 8, 1895, xxxvi, Jahrg., No. 49.

grape sugar in the urine within six hours after the administration of 100 grams of grape sugar. R. v. Jaksch[15] thought this phenomenon might be diagnostic of the existence of pregnancy. J. Hofbauer[16] found the assimilative power for carbohydrates progressively reduced in 39 of 45 cases from the end of the second month of pregnancy, and he considered the reaction as indicative of the existence of physiological conditions.

H. Ludwig[17] contends that the organism of a healthy pregnant woman reacts upon polysaccharids in the same way as does that of a non-pregnant individual, so that a failure to demonstrate diminished assimilation of carbohydrates cannot be accepted as evidence of the non-existence of pregnancy, while the appearance in the urine of a pregnant woman with abundant glycosuria of more than 1 per cent. of the sugar ingested with a mixed diet is of affirmative diagnostic significance. He examined the urine of 82 women for mellituria during the last eleven weeks of pregnancy and found no trace of sugar in 26, fermentable sugar alone in traces or in amounts determinable quantitatively in 10, fermentable sugar in traces or in amounts determinable quantitatively, but not alone, in 38, and varying amounts of fermentable and non-fermentable sugar in 8. A. Payer[18] determined that the assimilative power for grape sugar in pregnant women is in inverse relation to the maturity of the fœtus; that is, the farther advanced the pregnancy the more readily can alimentary glycosuria be induced. Other things being equal, alimentary glycosuria can be more readily induced in primiparæ than in multiparæ. The disparity is more marked with advancing years. On the other hand, Payer found glycosuria uncommon during pregnancy.

J. Veit[19] suggests that the glycosuria of pregnancy may be due to absorption of the glycogen contained in the chorionic tissues. He observed dextrose in the urine of rabbits when living young placental tissue was introduced into the abdomen.

In the course of 1800 urinalyses Robert N. Willson[20] noted that when sugar appeared in the urine of a pregnant woman not previously glycosuric the phenomenon was observed between the beginning and the end of the last month of gravidity. Occasionally a trace of glucose was observed throughout pregnancy, often disappearing completely after parturition.

Although sugar is thus said to be a frequent constituent of the urine during pregnancy, diabetes, on the other hand, appears to be quite an uncommon complication of gravidity. This fact is attributable to the circumstance that the disease is less common in women

[15] Prag. med. Woch., July 4, 1895, xxvii, 281.
[16] Wien. klin. Rundschau, xii, Jahrg., January 1, 1899, 1.
[17] Wien. klin. Woch., March 23, 1899, xii, 12, 305.
[18] Monat. f. Geburtsh. und Gynäk., 1899, x, 559, 784.
[19] Münch. med. Woch., July 17, 1906, 1437.
[20] Amer. Jour. Med. Sci., 1904, cxxvii, 261.

generally than in men, and that its incidence in women is greatest after the child-bearing period. There are, however, on record a small number of cases in which diabetes has recurred with successive pregnancies. Even rarer than diabetes complicating pregnancy is the occurrence of pregnancy in a diabetic woman. The reasons for this, in addition to those already given, are to be found in the state of impaired nutrition of the diabetic patient and the functional derangement and structural alteration of the internal generative organs that are often present.

J. M. Duncan[21] quotes Frerichs as stating in a private communication that of 386 cases of diabetes mellitus 282 occurred in males and 104 in females, and that of the latter only 1 was observed during pregnancy. From personal experience and a study of the literature Duncan concludes that diabetes may develop during pregnancy and even be present only in association with that condition; or that it may disappear with the termination of pregnancy, either to appear some time later or not to recur in a subsequent pregnancy; or that it may develop soon after labor. He recognizes the fact also that pregnancy may occur in a diabetic woman and, with parturition, be unaffected by the associated disease, although liable to be interrupted in its course by death of the fetus. Gaudard[22] expresses the view that diabetes in a mild form may set in at the beginning of pregnancy and disappear after labor, while a more severe form persists after delivery, and a still more serious variety rapidly terminates fatally. The condition, he finds, is aggravated by lactation. H. D. Fry[23] states that when a predisposition to diabetes exists pregnancy is likely to act as an exciting cause; when the disease is already present its type becomes aggravated. If a fatal termination does not take place before labor sets in, a change for the better may be expected at this time.

In a discussion of the principal complications of diabetes, Grellety[24] states that sexual indifference is habitual in consequence of the associated constitutional debility, and that impotence and sterility are a natural result. M. Loeb[25] relates that of 9 cases of diabetes mellitus in women under his observation 5 were complicated by disease of the uterus, namely, retroflexion, chronic metritis, fibroid, prolapse (2). M. Hofmeier[26] states that atrophy of the internal genitalia takes place in the sequence of diabetes mellitus in women.

In a discussion of diabetes in its relations with uterine activity, menstruation, and pregnancy Lecorché[27] calls attention to the fact

[21] Trans. of the Obstet. Soc. of London, 1882, xxiv, 256.
[22] Thèse de Paris, 1889; abstract in Centralbl. f. Gynäk., 1890, xiv, 24, 434.
[23] Trans. Amer. Gynec. Soc., 1891, xvi, 350.
[24] Lyon médical, 1880, xii, ann., t. xxxiii, 521.
[25] Berl. klin. Woch., October 10, 1881, 601.
[26] Ibid., October 15, 1883, 42, 641.
[27] Du diabète sucré chez la femme, Paris, 1886, 162 et seq.; extract in Annales de gynécologie, 1885, xxiv, 257.

that diabetes in women is observed especially before puberty and after the menopause, at the same time pointing out that the relative rarity of the disease appears counterbalanced by its gravity during this period. Both diabetes and the menopause are most common in women at about forty-four or forty-five years of age. On the other hand, diabetes is charged with causing more or less profound alterations in the function and structure of the uterus and its adnexa, so that frequently menstruation is irregular, painful, or absent, and conception is unlikely to take place. When pregnancy occurs the nutrition of the fetus is affected in such a manner that premature labor often takes place.

H. Senator[28] notes that menstruation becomes deranged in diabetic women only when nutrition is greatly impaired and that pregnancy has been observed to occur, although often interrupted by abortion. J. Seegen[29] found amenorrhœa an uncommon symptom in diabetic women, and he has observed normal menstruation, even in severe cases, up to within a week before death.

According to C. von Noorden[30] there is no general rule as to the occurrence of menstruation in diabetic women, amenorrhœa being noted early in some, while in others menstruation recurs at regular or irregular intervals until an advanced stage of the disease. He states that conception occurs frequently, even at a late period in the disease, and that pregnancy and the puerperium have no unfavorable effect on the diabetes, as illustrated by 5 diabetic women under his care who became pregnant. He admits, however, that in severe cases sexual desire is diminished and sterility likely to be present, and he advises against the marriage of young women having diabetes, as the disease is serious under such circumstances.

W. Lesse[31] believes that the prognosis is better in the case of a woman diabetic before pregnancy than in that of a woman who becomes diabetic during pregnancy. He considers the induction of premature labor advisable only in the presence of hydramnios or contracted pelvis. F. Schauta[32] considers diabetes a serious complication of pregnancy and especially during parturition. Accordingly, he would sanction the induction of abortion in the early months, as the fœtus is likely to die anyway; and also in the later months if the amount of sugar in the urine is large. G. E. Herman[33] favors the early termination of pregnancy as offering the greatest probability of benefit to the mother, especially if hydramnios be present. According to J. W. Williams[34] gestation in a diabetic woman sometimes exerts a deleterious influence on the course of

[28] Handbuch der speciellen Pathologie und Therapie, 1876, B. xiii, 2 H., 164.
[29] Der Diabetes Mellitus, 3 Aufl., Berlin, 1893.
[30] Die Zuckerkrankheit und ihre Behandlung, Berlin, 1898.
[31] Monat. f. Geburtsh. und Gynäk., 1902, xv, 680.
[32] Ibid., xvi, 470.
[33] Edinburgh Med. Jour., 1902, n. s. xi, 119.
[34] Obstetrics, 1903, 344.

the disease, and if the patient's condition should become alarming he advises the induction of premature labor.

P. Rudaux[35] states that diabetes retards the progress of pregnancy, equally whether it has been present before or has supervened upon conception. The diabetic woman seldom reaches full term; premature birth is more common than abortion before the child is viable. The amount of sugar increases about the sixth month and during the last days of the ninth month, and there is a definite relation between the amount of sugar and the death of the child. The fœtus may die in the uterus and be expelled subsequently; or, when it approaches term, it may die during labor or soon after birth. Death occurs during or after parturition in 41 per cent. of the cases. The most common complications are hydramnios and hydrocephalus; besides, the size of the child may be excessive. The effect of diabetes upon labor is unimportant, although uterine contractions are less energetic and, therefore, the period of parturition is prolonged. Diabetic patients are especially prone to septic infections, their tissues furnishing a favorable medium for the growth of pathogenic microörganisms. Lactation is well maintained and is accompanied with a diminution of the ordinary symptoms of thirst and polyuria. Part of the glucose is converted by the mammary glands into lactose, and a large proportion of the sugar found in the urine is lactose. On the other hand, pregnancy aggravates diabetes considerably, although the aggravation does not appear during the first four or five months. Toward the end of the fifth or during the sixth month the symptoms reassert themselves with increased intensity; the patient complains of thirst, and polyuria; glycosuria and emaciation become marked; or such complications as coma, loss of vision, paralysis, or syncope develop. The symptoms may have been so slight as to escape detection until aggravated by the pregnancy, or in cases that have been recognized prior to the occurrence of pregnancy the symptoms may have been dormant until the sixth month; but in either event the disease then makes rapid progress. In the latter days of pregnancy, should the patient go to term, the severity of the disease is greatly intensified; but after delivery some alleviation may be expected. Slight symptoms appearing toward the end of pregnancy and held in check by suitable treatment after delivery will be increased by a subsequent pregnancy. The average duration of diabetes is three or four years, but when complicated by pregnancy this is reduced to twenty months. The termination is usually due to coma, cachexia, pulmonary tuberculosis, or exhaustion, and it is often hastened by parturition. For an exhausted woman labor is a serious trauma, and sudden death or death within a few days after delivery will occur as a result of the shock. The effect of lactation can be looked

[35] La Clinique, October 19, 1906; Brit. Med. Jour., January 5, 1907; Epitome of Current Medical Literature. p. 2, No. 7.

upon only as harmful, as it prolongs the puerperal period and lowers the resistance of the maternal organism. When pregnancy occurs in a diabetic woman the prognosis is always serious for both the mother and the child.

I have observed a case of diabetes in which the glycosuria disappeared with the inception of pregnancy and reappeared only after the delivery at about term of a macerated fœtus. I have been unable to find in the literature the record of a parallel case.

M. G., a married colored women, aged thirty-seven years, was referred to my dispensary service at the Polyclinic Hospital, on February 18, 1905, on account of vulvar pruritus and a suspicion of diabetes. Her mother had died at forty-nine years of age of some disease of the kidney and gangrene of the leg. Her father, two sisters, and one brother were living, in good health. She had borne one child, sixteen years previously, but it had lived only nine months. She had herself had measles in childhood. The woman related that she had been sick for three years, during which period she had been passing large amounts of urine at frequent intervals. Micturition was attended with burning pain and there was a purulent vaginal discharge, with marked swelling of the vulva.

For a year the lower extremities had been swollen; for six months she had had severe backache, and she had lost fifty pounds in weight in two months. The woman admitted that she had a fondness for sweets, on several occasions indulging herself to the extent of a pound and a half of candy in twenty-four hours.

The patient had at various times lost different finger-nails. She complained of want of appetite and nervousness. She drank water excessively. Menstruation was regular, attended with moderate pain for the first twenty-four hours, and lasted for three days. There was no history of mental or physical shock.

The woman weighed 206 pounds as compared with 220 rather more than a year previously. The action of the heart was rhythmic. The sounds were clear and the second was accentuated in the aortic area. The knee-jerks were preserved. The urine was found to be free from albumin, but sugar was present in a proportion of 4.67 per cent. From four to five pints of urine were passed in the twenty-four hours. Under treatment, in part dietetic, in part medicinal—salol, sodium phosphate—the patient began to feel better and to gain in weight. The pain on micturition diminished, the vaginal discharge and the itching grew less. Menstruation occurred on February 28, 1905, and a trace of blood from the uterus appeared about April 1. At the latter date morning nausea was noted and anorexia was marked. There was some soreness of the breasts, both of which contained secretion. The glands themselves had not increased in size, but the areolar tubercles were enlarged. Pregnancy was suspected, although this condition had not been present for sixteen years.

Urine examined on March 4 contained only 1.17 per cent. of sugar and another specimen examined on March 18 contained 1.6 per cent., while no sugar at all was found in specimens examined March 28, April 1, 8, and 29, and May 2. On November 15, 1905, the patient complained of tenderness and dull pain in the lower portion of the abdomen. The facial expression was dull and sleep was poor. Thirst was almost unquenchable. Urine was passed in large amounts. The specific gravity was 1005 and there was no response to tests for albumin and sugar. Labor set in definitely on the following morning, but it progressed so slowly that the membranes were ruptured and artificial dilatation of the uterine mouth was undertaken. The breech presented and expulsive efforts were feeble. By manipulation a foot was brought down and then the other foot, and finally the trunk was extracted. The head appeared to be impacted at the brim of the pelvis and the fœtus had to be turned several times before descent could be effected. The umbilical cord had broken at the fœtal extremity and the fœtus was dead and macerated. The placenta and membranes were delivered manually. Labor had occupied more than thirty-six hours and was followed by profuse uterine hemorrhage. The patient became comatose, with stertorous breathing, but she eventually reacted and recovered. On November 20 the urine contained a trace of albumin, but no sugar. On the 22d also no sugar was present, but a small amount of albumin was again found, together with red and colorless blood corpuscles, amorphous and triple phosphates, squamous epithelial cells, and free granules. On December 1 symptoms of thrombophlebitis in the left thigh appeared. The urine still contained a trace of albumin, but no sugar. On the 8th sugar was again not demonstrable in the urine, but a trace of albumin was present, with one hyaline cast and a few finely granular casts, as well as leukocytes, crystals of uric acid and of calcium oxalate, squamous epithelial cells, and free granules. The subsequent history of the patient may be summed up briefly in the statement that the albumin disappeared from the urine, while in April, 1906, sugar was again found and the symptoms of diabetes previously present once more made their appearance The patient's weight, however, increased to 226½ pounds.

The patient was skilfully looked after during labor and the puerperium by Dr. Annie L. Conner, to whom I am indebted for notes covering that period of the case.

I append herewith abstracts of the cases that I have collected from the literature, giving separately those in which pregnancy was complicated by diabetes and those in which pregnancy took place in diabetic women. I have endeavored further to separate the cases in which diabetes recurred in successive pregnancies and those in which diabetes appeared during pregnancy after having been present temporarily at an earlier period.

I. CASES OF PREGNANCY COMPLICATED BY DIABETES.

J. M. Duncan[36] reports the case of a woman, aged thirty years, in the fifth month of her third pregnancy. She was married at twenty-six years, and her first child was born, decomposed, at term. Subsequently she presented a succession of boils, but her urine was not examined. Her second child was born, also decomposed and at term, fifteen months later, and again the urine was not examined. The woman became pregnant a third time six months later and now the urine was found "diabetic." Alarming symptoms developed in the seventh month and premature labor was induced. Improvement followed for a time, but later a fatal termination ensued.

It can be only a matter for speculation as to whether diabetes was present in the first pregnancy in this case, and whether it continued and was present also in the second pregnancy.

M. Loeb[37] reports the case of a woman, aged twenty-two years, who presented symptoms of diabetes in the second month of pregnancy. Abortion took place in the sixth month and death followed soon afterward.

In a paper on "Puerperal Diabetes," J. M. Duncan[38] reports 2 additional cases of his own and also 11 others from various sources, besides those of Bennewitz and Lecorché. In one of Duncan's cases, in a woman aged thirty years, there was a suspicion of temporary diabetes at the end of a former pregnancy. In the fifth pregnancy diabetes was discovered in the eighth month and the fœtus died before labor set in, at the beginning of the ninth month, with collapse. There was an excess of liquor amnii. Death took place on the third day after delivery.

Duncan's second case occurred in a woman, aged thirty-five years, in whom diabetes was discovered at the time of quickening in her eleventh pregnancy. A large child was born dead, and the symptoms of diabetes disappeared. Later, however, there was a relapse, and death took place in coma eight months after delivery.

The case of W. L. Reid (Duncan) occurred in a woman, aged thirty-two years, whose first pregnancy terminated in the delivery of a macerated fœtus. Diabetes was discovered early in the second pregnancy. The fœtus died in the eighth month and premature labor occurred a few days later. The liquor amnii was excessive. The diabetes persisted.

A case of Williams (cited by Duncan) occurred in a woman, aged thirty-six years, who developed diabetes early in her seventh preg-

[36] Edinburgh Med. Jour., 1873, xviii, ii, 696.
[37] Berl. klin. Woch., October 10, 1881, 601.
[38] Trans. of the Obstet. Soc. of London, 1882, xxiv, 256.

nancy. The fœtus died during pregnancy and was expelled in the eighth month. The mother died suddenly four months later.

Another case of Williams (cited by Duncan) occurred in a woman, aged thirty-three years, who first became pregnant at the age of twenty years, and exhibited thirst and emaciation, but became strong again after delivery. Her second pregnancy began when she was twenty-two years old, and was attended with the same symptoms. Her third pregnancy, which occurred when she was twenty-three years old, was attended with slight loss of flesh. There was a fourth pregnancy at twenty-five years, a fifth at twenty-eight years, and a sixth at thirty years. In the last there were again thirst and emaciation and incontinence of urine. The seventh pregnancy took place at thirty-three years, and its course was marked by wasting, thirst, and incontinence of urine. Glycosuria was discovered a short while after delivery, disappearing in the course of three months.

It is possible that in this case diabetes was present in the first second, third, and sixth pregnancies, but in the absence of any statement with reference to the urine the necessary certainty for the formation of an opinion is wanting. Although the discovery of sugar in the urine soon after the last labor renders it likely that glycosuria was present during the seventh pregnancy, the omission of a specific report on this point leaves room for reasonable doubt.

Husband's case (Duncan) occurred in a woman, aged twenty-seven years, in whom diabetes was discovered in the third pergnancy. The child was feeble at birth and died a few hours later. The liquor amnii contained sugar. The mother died eight months after delivery.

In Winckel's case (Duncan) diabetes was observed in the second pregnancy and the child was born alive.

In Davidson's case (Duncan) a woman, aged thirty-eight years, was found to be diabetic in the middle of her fourth pregnancy. Labor set in prematurely and the child lived for thirteen hours. The symptoms of diabetes disappeared, but returned, with a fatal termination, four months later.

Frerich's case (Duncan) occurred in a woman, aged thirty-six years, in whom diabetes was discovered in the eighth month of her tenth pregnancy. The lying-in was normal. Death took place fifteen months later from tuberculosis and gangrene of the lungs. On postmortem examination a tumor of the medulla oblongata was found.

L. Kleinwächter[39] reports the case of a woman, aged twenty-two years, who aborted a few weeks after marriage and during her second pregnancy presented symptoms of severe diabetes. In the thirty-second or thirty-third week amniotic fluid in excessive amount escaped and the patient went into collapse. Forceps were applied

[39] Wien. med. Presse, 1904, xlv, 51, 2448.

and an immature fœtus was delivered.] The child lived for but a short time and the mother died eighteen hours after labor. Kleinwächter believes the disease must have commenced in the twentieth year.

M. J. Durieux[40] reports the case of a woman, aged thirty-seven years, whose first pregnancy, attended with albuminuria and eclampsia, resulted at term in the birth of a dead infant. Six weeks after labor all trace of albumin had disappeared from the urine. The second pregnancy was interrupted in the second month by abortion without appreciable cause. Symptoms of diabetes made their appearance in the seventh month of the third pregnancy. A healthy child was born at term, and the urine was free from albumin and sugar after disappearance of the lochia.

B. Naunyn[41] refers to the case of a woman, aged thirty-nine years, who presented symptoms of diabetes in her ninth pregnancy and four years later still had pruritus and glycosuria.

H. D. Fry[42] reports the case of a woman, aged thirty-one years, who exhibited symptoms of diabetes in the fifth month of her second pregnancy. The fœtus died in the seventh month and premature labor followed. The mother died on the fifth day.

Born[43] reports the case of a woman, aged twenty-four years, who in the seventh month of pregnancy died in diabetic coma. The uterus contained a macerated fetus.

E. L. Partridge[44] reports the case of a woman, aged twenty years, who developed diabetes in the fourth month of her first pregnancy, the disease subsiding in the seventh month, and labor taking place at term, with the delivery of a healthy child. The urine was free from sugar one month afterward.

E. Rossa[45] reports the case of a primipara, aged twenty-eight years, with a rachitic contracted pelvis, whose urine in the sixth month of pregnancy yielded a distinct reaction for sugar, which was found to be due to dextrose. The fœtus was living and exhibited hydramnios. The patient declined Cesarean section, so that premature labor was induced. The membranes were ruptured and three liters of amniotic fluid was evacuated. Delivery ensued sixteen hours later, but the fœtus lived for only thirty-two hours. Grape sugar was found in the amniotic fluid, but not in the fœtus' urine. The sugar disappeared from the mother's urine six days after labor. The case is considered one of mild diabetes superinduced by pregnancy.

G. E. Herman[46] reports the case of a woman, aged thirty-two years, who had borne seven children. All of the labors were difficult and

[40] Bull. de la Société d'Obstét. de Paris, 1905, viii, 141.
[41] Der Diabetes Mellitus, Vienna, 1906, 234.
[42] Trans. Amer. Gynec. Soc., 1891, xvi, 350.
[43] Correspondensblatt f. Schweiser Aerste, 1892, xxii, 347.
[44] Med. Rec., July 27, 1895, 109.
[45] Centralbl. f. Gynäk., June 20, 1896, 25, 656.
[46] Edinburgh Med. Jour., 1902, n. s. xi, 119.

the last three children were stillborn. In the third month of her eighth pregnancy the woman was weak, with an irritating vaginal discharge, burning micturition, itching, and boils. For three months there had been thirst, as there had been also in previous pregnancies, and for one month loss of flesh. The woman had been told in the fourth month of pregnancy that she had diabetes. When seen in the seventh month she had bearing-down pains and vomiting, and in a few days she became moribund. The urine contained albumin and sugar. Fluctuation was present over the uterus. The fœtal heart sounds could not be heard, nor fœtal movements felt. The membranes were ruptured and a large amount of amniotic fluid escaped. Natural delivery of a decomposed fœtus took place. The amniotic fluid was excessive and contained albumin and sugar. The woman died ten days later.

In the absence of a knowledge of the state of the urine no opinion is possible as to whether diabetes was present in any of the pregnancies but the last.

A. Stengel[47] reports the case of a woman, aged thirty-three years, in whom symptoms of diabetes were observed in the fourth or fifth month of her second pregnancy. A healthy child was born at term, and the glycosuria disappeared one month after labor.

II. CASES OF DIABETES IN SUCCESSIVE PREGNANCIES.

Bennewitz[48] reports the case of a woman who in her fourth pregnancy suffered from insatiable thirst and polyuria, which ceased after delivery. The urine was not examined. During her fifth pregnancy, at the age of twenty-two years, she presented the same symptoms and the urine examined at this time contained "two ounces of saccharine matter to the pound." Labor set in prematurely and the woman gave birth to a twelve-pound infant, which died in the process of delivery. The woman was well again in a short while and the urine free from sugar. Six months later she became pregnant for the sixth time, with the same symptoms as she had previously exhibited, but these all disappeared after delivery. It is possible that diabetes was present during the fourth pregnancy as well as during the fifth and the sixth.

A case of Williams (cited by Duncan) occurred in a woman, aged twenty-five years, in whom diabetes was discovered the day following the birth of her first child at term. The sugar gradually disappeared from the urine, but it reappeared in the succeeding pregnancy, which terminated in the birth of a healthy child, with an excess of liquor amnii, in which, however, no sugar was found.

[47] Univ. of Penna. Med. Bull., October, 1903.

[48] Osann's 12. Jahresbericht des polikininsichen Instituts zu Berlin, p. 23; Edinburgh Med. Jour., 1828, xxx, 217.

Sugar was present again in the third pregnancy, at the termination of which the mother was safely delivered of a small child. Death took place, however, one month later, in coma.

This case belongs also in the next category, being one in which the diabetes recurred during pregnancy after having previously been present temporarily.

F. A. Packard[49] reports the case of a woman, aged forty-one years, in whom symptoms of diabetes were present during each of four pregnancies, disappearing, however, in the intervals, but persisting after the last. The gravity of the symptoms increased progressively with each succeeding pregnancy and all terminated in miscarriage.

M. A. Tate[50] reports the case of a woman, aged thirty-five years, in whom symptoms of diabetes were observed in the third month of her second pregnancy and miscarriage took place in the fourth month. Sugar had disappeared from the urine one month afterward. Similar symptoms appeared in the third month of the third pregnancy, the course of which, however, was not interrupted. Labor terminated normally and the sugar disappeared from the urine.

III. CASES IN WHICH DIABETES RECURRED DURING PREGNANCY AFTER HAVING PREVIOUSLY BEEN PRESENT TEMPORARILY.

M. Graefe[51] reports the case of a woman, aged thirty-seven years, who several years following the birth of her sixth child presented symptoms of diabetes, which, however, disappeared under treatment. Fifteen months later she became pregnant for the seventh time and the symptoms of diabetes returned. In the seventh month fœtal movements ceased and a dead fœtus was delivered. The mother improved for a time, but subsequently grew worse.

W. Liepmann[52] reports the case of a sextipara, aged thirty years, with a previous history of diabetes mellitus, but whose labors had always taken place normally. Polyuria, glycosuria, and albuminuria, with hydramnios, were discovered about the fifth month of pregnancy. Two months later the membranes were ruptured and 11 or 12 liters of fluid evacuated. The fœtus was extracted with some difficulty and copious postpartum hemorrhage ensued. The sugar disappeared from the urine for a short time, but soon reappeared, and death took place nine days after delivery. In addition to degeneration of the kidneys, arteriosclerosis, and gastric ulcer, dissecting metritis was present.

J. Fels[53] reports the case of a woman, aged thirty-four years, who

[49] Univ. Med. Mag., 1888–89, i, 229.
[50] Amer. Jour. of Obstet., January, 1906, liii, 65.
[51] Sammlung zwangloser Abhandlungen aus dem Gebiete der Frauenkrankheiten und Geburtshilfe, 1898.
[52] Archiv f. Gynäk., 1903, lxx, 426.
[53] Wien. med. Presse, 1905, 13, 627.

some time after her third pregnancy presented symptoms of diabetes. These cleared up under treatment, but reappeared later, in a fourth pregnancy, again disappearing under treatment. The woman was delivered of a normal living child at term, but died three years later, in coma.

IV. CASES OF PREGNANCY IN DIABETIC WOMEN.

Lecorché[54] reports the case of a woman, aged twenty-eight years, who was found to be diabetic following the birth of a child six years previously. The infant also became diabetic. Two years subsequently the woman became pregnant again and gestation went on to favorable termination.

Two cases of Newman are cited (Duncan). Both occurred in women, aged thirty-six years. In one diabetes developed during or perhaps before the first pregnancy, which terminated in normal labor, and it persisted throughout two succeeding pregnancies. The second pregnancy and parturition also were normal. In the third pregnancy the child was born dead at six or seven months and the mother died three days later. In the second case diabetes was observed in two pregnancies. The children were born alive, but the mother died in coma two years after the birth of the last child.

Duncan cites a case of Seegen in which three pregnancies occurred during the course of diabetes. All ended in miscarriage in the fourth or fifth month, with death of the mother after the last.

F. Minot[55] reports the case of a woman, aged twenty years, who in the fifth month of pregnancy was seized with vomiting after a hearty meal, gradually became unconscious and died two days later. When first seen, six months previously, she presented the usual symptoms of diabetes, passing, in twenty-four hours, seven pints of urine containing large amounts of sugar.

H. Ludwig[56] reports the case of a woman, aged forty-two years, who in her ninth pregnancy presented symptoms of diabetes of two years' standing. In the eighth month the abdomen became greatly distended and acetone and diacetic acid appeared in the urine in addition to sugar. The membranes were ruptured and an excessive amount of amniotic fluid evacuated, followed by a macerated fœtus. The mother's condition steadily improved. The amniotic fluid contained dextrose (0.30 per cent.).

In the course of a discussion before the Obstetrical Society of London, Griffith[57] referred to a case of diabetes of some years' standing, in a woman who became pregnant and passed through pregnancy and labor without any sign of danger.

[54] Archives générales de médecine, 1882, i, 385.
[55] Boston Med. and Surg. Jour., January 19, 1888, 69.
[56] Centralb. f. Gynäk., March 16, 1895, 11, 281.
[57] Lancet, June 23, 1906, 1761.

An analysis of the foregoing cases shows that in the vast majority, namely 27, diabetes occurred as a complication of pregnancy, while in only 8 did pregnancy occur in diabetic women. Among the former diabetes recurred in four successive pregnancies in 1 case, and in two successive pregnancies in 3 cases. In 3 cases diabetes recurred during pregnancy after having previously been present temporarily. Two diabetic women became pregnant thrice and 1 other pregnant twice.

The association of pregnancy and diabetes was noted at almost all ages between twenty and forty-two years, without especial prevalence at any one period. It occurred most commonly in the first, second, and third pregnancies, although it has been observed also in later pregnancies, up to the eleventh. The existence of the diabetes was recognized in the majority of cases in the first half of pregnancy, although in these, as in the others, it may naturally have existed prior to its detection.

Death of the fœtus resulted in the predominance of the cases, namely, in 28 as against 11, either during the continuance of pregnancy or as a result of miscarriage or premature labor, spontaneous or induced. In a considerable number—8—hydramnois existed, the amniotic fluid containing sugar in 4 instances. One infant became diabetic.

Of the mothers 19 died at varying periods following delivery, and 4 of these after temporary improvement. In 3 the diabetes persisted, in 1 it grew worse after temporary improvement. In 7 cases diabetes was present in successive pregnancies. Improvement or recovery took place in 10 cases. My own case is unique in the disappearance of the glycosuria with the advent of pregnancy and its reappearance a short time after delivery.

SUMMARY. There is evidence to show that the power of assimilating carbohydrates is diminished in conjunction with pregnancy, and this deficiency may be manifested by the appearance of sugar in the urine.

Transitory glycosuria toward the end of pregnancy or during the puerperium may be considered physiological and related to the activity of the mammary glands in the secretion of milk; therefore, a resorption phenomenon.

Diabetes is an uncommon complication of pregnancy, partly because the disease is, in general, less common in women than in men, but principally because diabetes occurs, as a rule, at a later period of life than pregnancy usually takes place. Occasionally diabetes has been noted in two or more successive pregnancies.

Pregnancy occurs even more rarely in diabetic women, partly because, in addition to the reasons already given, of the depraved nutrition of the diabetic patient and of the disordered function and structure of the internal generative organs.

The complication of the one condition with the other usually

increases the gravity of both. Often the fœtus dies *in utero*, and miscarriage or premature labor takes place, or the child may die during birth or shortly afterward. The child also may be diabetic. The liquor amnii has been found increased, and in some instances also to contain sugar. The mother often dies of the disease, sometimes during pregnancy or in childbirth or shortly afterward.

Accordingly, a diabetic woman should not marry; or if married she should not become pregnant. In the event of a diabetic woman becoming pregnant or of a pregnant woman becoming diabetic, pregnancy need not be interrupted artificially unless some special indication arises. If the woman is safely delivered she should not nurse her child.

HYPERTHYROIDISM.

By Arthur R. Elliott, M.D.,

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A typical case of Graves' disease, with the cardinal and subsidiary symptoms all characteristically grouped, is diagnosticated without difficulty. In the pure type of the disease, the five cardinal symptoms occupy the foreground of the clinical picture with the various secondary functional manifestations present, but less constant and intense. The diagnosis becomes somewhat difficult if the secondary symptoms are predominant, with but one or two cardinal indications present. Most recent writers on the subject refer, with more or less emphasis, to this class of cases, and there is an apparent disposition to distinguish a mild and temporary from the essential or chronic form of Graves' disease. The attempt to draw a sharp line of distinction has little vindication from practical experience, since we are constantly observing a gradual transition and eventual termination of the mild in the severe and fully-developed disease. In the clinical valuation of the different grades of thyroid toxemia, or Graves' disease, the matter stands much in the same light as the inter-relationship of the glycosurias and diabetes. It is only in perspective that we are able to estimate whether a functional perversion is the expression of some essential malady, or merely a mild and transient reaction to irritation. The necessity for the proper recognition of these atypical forms of Graves' disease is great, in consideration of the fact that the disease, so far as we can now tell, is one and the same, whether we call it complete or incomplete—difference being a matter of degree only. Various names have been applied to these mild types of the disease. They have been designated "aberrant types," "pseudo-Graves'," "formes fruste," "larval types." The term

"hyperthyroidism" has often been employed to characterize states of thyroid toxemia which are apparently less than Graves' disease. It is with these subtoxic states that the present paper is concerned.

The frequency of occurrence of morbid overactivity of the thyroid gland is probably much greater than is generally believed; for, with the present better appreciation of the nature of thyroid intoxication, many cases are being thus interpreted that in other times were probably passed over as instances of neurasthenia, hysteria, functional heart disease, anemia, etc. My own experience has brought to my attention with strong emphasis the importance of thyroid toxemia as a complicating element in clinical work.

The question of the pathogenesis of Graves' disease seems at last settled in favor of the theory of Möbius, which postulates an overactivity or perverted activity of the thyroid gland as the essential feature. The vasomotor, nervous, and cardiac symptoms are toxic phenomena, dependent on the presence in the blood of excessive amounts of thyroid secretion or of thyroid secretion of abnormal quality. The primary cause of the thyroid disturbance is still left unexplained, although there seems little doubt that it is a toxic reaction, dependent on some morbid material as yet unidentified. The whole structure of the surgical treatment of Graves' disease rests upon the theory of hyperthyroidism, and if it be not true, then the hundreds of thyroidectomies which are now matters of record remain without justification. The striking influence over the disease, which follows a well-executed partial thyroidectomy, furnishes evidence in favor of the theory of hyperthyroidism, which is so direct as to be apparently irrefutable. The rapidly accumulating surgical records in Graves' disease furnish a clinical document that has few parallels in the history of modern medicine.

The results of thyroid feeding supply evidence which is hardly less conclusive. The administration of thyroid gland substance, or thyroid extract, is capable, if given in sufficient amount, of inducing a toxic state, which in almost every essential is similar to Graves' disease. An artificial state of hyperthyroidism is thereby produced, which duplicates almost in full the morbid syndrome. Even the characteristic exophthalmic symptoms have been observed after thyroid feeding by Auld, Béclere, and others, and Edmunds was able to induce proptosis, widening of the palpebral fissure, and dilatation of the pupils, in six monkeys, by this means, even after excision of a portion of the cervical sympathetic.

The following clinical instance of artificial thyroid toxemia constitutes a striking example of the effect upon the human: My patient is a young man, aged twenty-two years. He was referred to me for general examination by Dr. Thomas A. Woodruff, of Chicago, who had found low grade degenerative changes in the choroid, such as are produced by the chronic intoxications. Omitting all details of the case, which have no bearing on the purpose of the

present citation, it will suffice to state that the patient has a small, simple goitre, which has existed without symptoms since childhood. A few weeks before examination he experienced for the first time a sense of swelling and constriction of the throat, excessive sweating, and a good deal of restlessness and general nervousness. Examination revealed a well-developed thyroid toxemia, marked by restlessness, hyperidrosis, exaggerated reflexes, tachycardia (pulse 100 to 126), excessive pulsation of the carotids and femorals, fine tremor of the hands, tongue, and closed eyelids. There was no exophthalmos. It appeared that four months before the date of consultation, he had been induced to take thyroid extract to remove his goitre, and, not observing any effect upon the tumor, had gradually and steadily increased the dosage, believing the stuff harmless. From 15 grains daily—the initial dose—he had attained an average of 75 grains a day, and affirmed that he had taken 200 5-grain tablets (1000 grains) during the preceding week. The maximum daily quantity taken on any one day was 150 grains. Strange to say he had gained perceptibly in weight during the time he took the preparation. Discontinuance of the drug, under my directions, resulted in a prompt subsidence and final disappearance of the toxic symptoms.

The exact part that the thyroid plays in systemic metabolism is, unfortunately, still largely a matter of conjecture. Certain empirical physiological facts have been accumulated by clinical observation, which apparently have a bearing on the incidence of thyroid functional perversions. That the gland exerts an influence on the development of the organs of generation of both sexes and is affected by the vicissitudes of the sexual life of the individual, is demonstrated by many observations. The asexuality and infantilism of cretins and the different cretinoid states is well known. The intimacy of relationship between the thyroid and the generative organs is much greater in the female than in the male, probably owing to the recurring functional demands of menstruation, pregnancy, and lactation, and we consequently encounter thyroid disturbance with much greater frequency in women than in men. In many women the thyroid enlarges at the first menstruation, and at each subsequent period, producing at times an appreciable enlargement. It is stated that in girls the commencement of the sexual life is accompanied by an enlargement of the thyroid, and the gland has been observed to enlarge during rut in the cat, rat, sheep, and deer. Suppression of the menses may produce an enlargement of the thyroid, which subsides on their re-establishment. It is stated by Richardson that in Southern Italy it has long been the custom for the parent to measure carefully the circumference of the daughter's neck before and after marriage—an increase in size being considered an evidence of pregnancy. Thus the thyroid gland is subject to congestion and functional hypertrophy under the nor-

mal conditions of puberty, menstruation, marriage, and pregnancy. Although physiological in their inception, these thyroidal disturbances may at any time, under persistent or excessive stimulation, pass the borderline and become pathological, causing symptoms of the Graves type.

The following instances from my case records exemplify this transformation: A little girl, aged eleven years, was brought for examination by her mother, who was concerned over an enlargement of the child's neck which had appeared in December last. Menstruation had occurred first in February, two months after the appearance of the goitre, and again in March and April. It had been observed that the tumor was larger at the menstrual periods than at other times. On examination it was found that in addition to a small bilateral goitre, there was a well-marked fine tremor of the hands and slight irregular twitching of the extremities, sweatings, flushings, morbid blushing, general nervousness, and mental depression. The pulse was persistently above 100; temperature 99.5°. It is interesting to note the fact that in this case the thyroid enlargement antedated puberty. Broca and Richardson suggest that as the thyroid apparently presides over the development of the generative organs, its failure to secrete being marked by infantilism and sexual involution, it might be serviceable to administer thyroid gland substances in cases of delayed puberty.

Another case of somewhat different character and greater interest is that of a young lady of Syrian birth, now nineteen years of age. I might note the fact in passing that, after a considerable experience during three years' work among the Syrian colony in Chicago, more than one-half the women of this nationality I have seen have enlarged thyroids. They are otherwise normal and well developed. The girl under reference has had a small-sized simple goitre since early childhood. Three months previous to consultation she began to experience backache, dizziness, palpitations, dyspnœa, hot flushes, sweatings, insomnia, and gradually lost in body weight. Menstruation since fourteen; regular, but scant. Examination revealed marked throbbing of the neck vessels and abdominal pulsation, exaggerated reflexes, dermographia, moist skin, fine tremor of the hands, lid, and tongue tremor. Blood examination showed slight anemia; urine normal. During ten weeks' observation, the pulse was never observed below 100. Average systolic blood pressure, 100 mm. (Stanton). At the end of this period of observation the patient married. Within a week after marriage all symptoms had abated, and she rapidly put on flesh, regaining all her lost weight (eight pounds). She remained entirely free from the former troublesome symptoms for two months when she became pregnant. This has had the effect of causing a reappearance of the thyroid toxemia. The rapid disappearance of toxic symptoms after marriage, it seemed to me, very evidently indicated that the nervous stress and sexual

stimulation of courtship were the exciting factors in causing hyperthyroidism. Re-appearance of the symptoms with the advent of pregnancy is not surprising, as we well know that during pregnancy there is a marked increase in thyroid activity. Freund observed augmentation in the size of the gland in 45 of 50 pregnant women, and Lange in 108 of 133 cases examined. In myxedematous women a marked improvement during pregnancy has been observed—the increased thyroid secretion being utilized by the mother to the probable detriment of the child. The functional stimulation of the thyroid incident to pregnancy usually extends throughout lactation, at the end of which period this physiological hypersecretion subsides without detriment to the gland. Occasionally it may serve as the starting point of a genuine Graves' disease, or, on the other hand, excessive thyroid involution may result, producing myxedema. Rapidly succeeding pregnancies with their attendant lactations, are particularly hazardous to the welfare of the gland.

The following case is cited from personal observation: A woman, now thirty-six years of age, has been married eight years, and during the first six years of her married life had five successful pregnancies, one a twin birth. She has always done her own housework and nursed her children. She observed a swelling of the neck four years ago. She complained of early and excessive fatigue on exertion, poststernal heaviness, frequent palpitation, dyspnœa on effort, evening malleolar œdema, sweating, backache, anorexia, excessive urine, and frequent micturition. Menstruation regular. Physical examination showed a pulse of 118; reacting excessively to effort and change of position. Systolic blood pressure, 135 mm.; diastolic, 105 mm. (Stanton). Exaggerated knee-jerks; moist skin; fine rhythmical tremor. There is distinct cardiac enlargement; no exophthalmos. A small uniform bilateral goitre exists.

One of the cases cited represents the type of thyroid toxemia arising in the presence of a simple goitre of long standing. It is far from uncommon to observe transient periods of tachycardia, tremor, sweating, and emotionalism in cases of ordinary goitre. Bloodgood[1] has recently called attention again to this association. Rarely in this group do we observe exophthalmos, the toxemia being manifested by nervousness, tremor, and tachycardia. These symptoms have been observed in simple goitre, thyroid cysts, adenoma, carcinoma, and tuberculosis of the gland. These toxic outbursts are usually comparatively mild, but are undoubtedly of the nature of Graves' disease. Bloodgood states that, as a rule, in cases of this character one will find cellular changes in the thyroid tissue identical with those of Graves' disease. Appreciation of the true significance of these toxic symptoms is of much practical importance to the surgeon. Cases of goitre of whatsoever form, which exhibit symptoms of this character, are to be operated upon with caution,

[1] Surgery, Gynecology, and Obstetrics, August, 1905.

owing to the greatly increased liability to the development of post-operative thyroidism in such subjects. Clinical observations of this character certainly furnish a very strong presumption in favor of the identity of hyperthyroidism and Graves' disease—the difference being mainly a question of dosage.

In addition to the foregoing types of hyperthyroidism, which are physiological in their inception, there are met with at least two other forms of thyroid hyperactivity, which are secondary to definite pathological states elsewhere in the economy. In many cases of valvular heart disease, particularly lesions of the mitral valve, whether primary or secondary to myocardial weakess, the thyroid may undergo enlargement from venous engorgement, and symptoms of hyperthyroidism may result. Much practical difficulty may arise in the more pronounced instances of this character in determining whether the thyroid enlargement and toxemia are the result of the valvular lesion, or its cause.

Another type of hyperthyroidism of great clinical interest is toxic hyperthyroidism. The simplest variety of this class of cases is the fulness of the neck, palpitations, tremors, sweatings, and depression, so frequently observed during the course of the anemias. Most cases of pronounced chlorosis are accompanied by some manifestation of this nature. In those of highly nervous temperament, especially women of hysterical tendencies, any form of systemic toxemia may awaken a morbid degree of activity in the thyroid, manifested by fulness of the neck and the characteristic vasomotor and nervous phenomena. Digestive toxemia, syphilis, diabetes, Bright's disease, may be so accompanied. I cite the following instance of its association with Bright's disease. There is not lacking an hereditary and personal predisposition to thyroid perversion in this patient. A sister died of Graves' disease and cardiac dilatation under my observation, and the patient gives a history of a year's ill-health at the age of eighteen, characterized by dyspnœa, palpitations, and obscure nervous manifestations. She remained in good health until four years ago, when albuminuria developed and chronic nephritis was diagnosticated. The case has been a high blood pressure one, with polyuria, dyspnœa of effort, but never any œdema or uremia. Four months ago a goitre appeared and has persisted, at the present time constituting a moderate-sized bilateral tumor. Rapid loss of weight followed—until the deficit amounts to 61 pounds (from 165 to 104 pounds). There was sweating, palpitation, pigmentation of the surface, tremor, morning headaches, and mental depression. No exophthalmos exists. The fundus oculi shows choroidal degenerative markings and vascular alterations. The heart is markedly enlarged, a faint systolic whiff is audible in the mitral area. The pulse varies from 110 to 130, very irregular in rhythm. Blood pressure: systolic, 165 mm.; diastolic, 100 mm. (Stanton). The urine shows a considerable albuminuria, and degenerative renal products.

Tuberculosis is frequently accompanied by symptoms which strongly suggest a thyroid source, and, in practical experience, it is not uncommon to meet with mild hyperthyroidism during the incipient stages of the disease. The two conditions resemble each other not a little, having in common slight pyrexia, sweating, flushing, increased reflexes, rapid pulse, and decline in body weight. It is not unlikely that many cases of hyperthyroidism in which no actual thyroid enlargement exists are wrongfully suspected of being incipient tuberculosis. The mistake is a natural one at a stage when sputum is not available for bacteriological diagnosis. A misjudgment in the opposite direction would be a much more prejudicial clinical error. How difficult the problem may be is illustrated by the following case: A young woman, aged twenty-two years, by occupation a clerk, consulted me several months ago. There is a good family and personal history; hygienic surroundings are average, although her occupation is confining. One year previously she had an acute infection of unknown character, marked by repeated chills and pyrexia, and it is from this attack that she dates her ill-health. Since then she has been weak and nervous, has troublesome hot flushes and hyperidrosis, so that she is constantly wiping her face and hands. There is troublesome palpitation, insomnia, headache, backache, dyspnœa, sternal pain and weight, and a slight hacking cough in the morning. Menses irregular. Steady decline in weight. There is an afternoon temperature varying from one-half to one degree above normal, increased by bodily activity and slightly greater during menstrual periods.

Examination shows a slightly enlarged heart and faint systolic bruit. There is a slight fulness of the neck; the pulse varies from 100 to 130. Average systolic blood pressure, 120 mm. (Stanton). There is well-marked fine muscular tremor of the hands and eye lids. Urine normal. Blood examination shows slight simple anemia. The sputum, which is scant, was examined several times with negative results. I would have been inclined to regard this case as the hyperthyroidism of menstrual irregularity in an hysterical woman had it not been for a small area in the upper part of the left lung, which left a doubtful impression on examination. Close observation of this focus covering a period of two months enabled me to watch its development into a typical area of tuberculous involvement.

It is not at all improbable that the thyroid secretion plays a part in the resistance offered by the organism against acute infectious diseases. We may infer as much from the frequency with which swelling of the gland is observed in acute infections of microbic origin. Statistics are not wanting in this connection.

Vincent[3] draws attention to painful swelling of the thyroid in 50 per cent. of his cases of acute articular rheumatism with fever.

[3] Bulletin et Memoirs Soc. Méd. de Paris, 1906, xxiii, 598.

The swelling is most marked at the outset, and when the gland is not spontaneously painful it is tender to pressure. The swelling and tenderness disappear with improvement of the general symptoms. Vincent does not regard this as in any way peculiar to rheumatism, as it occurs in other infections as well. He has found the same thing in 11 of 17 cases of typhoid fever, in 1 of 4 cases of meningitis, in 7 of 15 cases of measles, in 9 of 19 cases of scarlet fever, in 1 of 9 cases of mumps, in both of 2 cases of erythema nodosum, and in 2 of 5 cases of acute malaria. These observations would certainly lead us to believe that the thyroid plays a part in the defence of the organism against acute microbic processes, and to infer that the gland is stimulated to increased physiological activity by toxins which its secretion is in some way destined to neutralize (Marin).

A possible sidelight on the connection between hyperthyroidism and Graves' disease is forthcoming from a consideration of the following statistics of the association of acute rheumatism and Graves' disease: Robinson[3] reports 127 cases of Graves' disease, 18.9 per cent. of which gave a definite previous history of acute rheumatism. West, in 1886, reported 38 cases of Graves' disease, 8 of which had a history of acute rheumatism. In 1890, MacKenzie collected 40 cases, 9 of which gave a history of quinsy and 5 acute rheumatism. In 1893, Thompson reported 8 cases of Graves' disease, 3 of which had had acute rheumatism. In view of these suggestive figures, taken in connection with the statistics of Vincent, it is incumbent on us to investigate the personal history of every case that comes under observation with especial reference to preceding acute infections. We are coming more and more to realize the deleterious late after-effects of acute microbic infections. The offence which is offered to the systemic tissues by the severe infectious toxemias is not one which is quickly condoned. We are much too apt to minimize the etiological importance of acute infections occurring in the antecedent history of patients who are suffering from obscure organic dystrophies and nutritive disorders. Many cases of organic disease of the liver, kidneys, vascular system and heart, as well as cases of diabetes and the essential anemias, can, with a fair degree of certainty, be traced back to an acute infection occurring, perhaps, many years previously. In consideration of the prominent part played by the thyroid in the resistance of the organism to acute disease, and the frequency of severe congestions of the gland, as shown by the observations of Vincent, we may, with reason, hypothesize some connection between acute microbic infections and Graves' disease. A severe toxic hyperthyroidism or a prolonged functional strain upon the organ, such as results from repeated pregnancies, anemia, etc., may beget a morbid irritability of the thyroid, which merely awaits the exciting factor

[3] Lancet, 1906, i, 1037.

of a sudden functional demand, resulting from shock, fright, or severe emotional disturbance, to establish the pathological type of thyroid overactivity known as Graves' disease. A careful, systematic inquiry into the previous history of every case of Graves' disease, with a view to tabulating the acute infections, neuropathical disturbances, anemias, menstrual disorders, etc., might yield suggestive data toward a better understanding of the etiology of this obscure disease.

PYELONEPHROSIS OF A SUPERNUMERARY KIDNEY.

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Mr. C., a medical student, aged twenty-three years, entered the Carney Hospital in September, 1906. Ever since he was three months old a swelling, the size of a hen's egg, had been observed in the left lower quadrant of his abdomen. From his third to his eighteenth year he had frequent attacks of "indigestion" following indiscretions in diet. The symptoms of these attacks were general abdominal pain, vomiting, and fever, and a tumor would appear in the left lower quadrant, last three or four days, and disappear when the bowels moved. During the last five years he has been free from attacks of this character. Four months before he came to Boston, after an illness of four days, he entered a hospital in a neighboring city. He complained then of headache, fever, malaise, constipation, and dull, bearing-down pains over the bladder. He had no vomiting or chills. A large globular mass was felt rising above the pelvis nearly to the level of the umbilicus. This tumor resembled a distended bladder, but when the latter was catheterized, the tumor merely sank back toward the sacrum. It was tender to pressure, especially to the left of the median line. There was some spasm of the rectus. There was a leukocytosis of 12,000, but a differential blood count proved negative. At the operation the surgeon found a cyst-like globular mass, the size of a child's head, situated in the position of a distended bladder. The bladder itself could be felt low down in the pelvis to the right of the tumor. The latter was free on all its surfaces except on the left, where it appeared to be adherent to the lateral pelvic wall. There was no connection between the tumor and the colon, sigmoid, or rectum. On aspiration 22 grams of an odorless, puriform fluid was withdrawn. This was reported to contain vacuolated organisms. The cyst-like tumor was opened and then packed with iodoform gauze; the

edges were sutured to the abdominal wall. Cultures from the contents remained sterile. The patient made a good recovery and left the hospital with a discharging sinus. Slight weakness and some loss of weight followed the operation; otherwise, he was well. The discharge lessened, his health improved, and, when he came to our clinic, he was feeling quite well. The discharge from the sinus resembled vaselin. There was some resistance in the region of the scar, and an indefinite mass, not tender on pressure, could be felt. The urine was clear, acid, with specific gravity of 1012, and was free from albumin, sugar, and sediment.

Under ether we packed and closed the sinus, made an incision a little to the left of the median scar through the posterior sheath of the rectus and entered at once into a cyst. This contained a vaselin-like substance enclosing minute, brownish dots of the size of pin-heads that resembled blood, masses of brightly refracting, yellowish granules, and some odorless, watery fluid. The cyst wall was 2 to 3 mm. in thickness and lined with a membrane much like that of the bladder. The wall, though friable, could be peeled from the surrounding tissues by sponge dissection. As the tumor was freed more and more it was found to lie entirely without the peritoneum, and to be situated close beneath the median line and somewhat to the left. As the deeper portions were drawn upward into the wound, the cyst was seen to terminate in a cone-shaped process, from which, without a visible canal, a definite cord, 5 mm. in diameter and about 4 cm. long, passed to the bladder, apparently at the latter's fundus. On the supposition that we were dealing with a urachal cyst, the cord or tube was ligated and cut and the sac turned upward and forward from below. Above, it extended in a pouch-like process to the region of the umbilicus, and this portion, having been dissected up rapidly and carelessly, the cyst was removed. As soon as tension was removed sharp arterial hemorrhage came from the deeper part of the abdomen, and the original abdominal incision was rapidly extended upward. The source of the bleeding proved to be an arterial branch of the sigmoid flexure. The latter was found to have been cut across as it lay against the anterior abdominal wall. The upper angle of the abdominal wound opened for the first time the abdominal cavity, and the sigmoid was found to be lying obliquely at the level of the umbilicus and pushed forward against the anterior abdominal wall by the cyst, which had been posterior to it and behind the peritoneum. The cavity previously occupied by the cyst extended from the median line anteriorly to the median line posteriorly, pushing down into the pelvis behind the bladder, which was forced upward and to the right. With the restoration of the bladder to its normal situation, the cordlike termination of the cyst was seen to be attached to the bladder at the normal insertion of the left ureter, and examination of its stump showed that it contained mucous tissue centrally. Careful search

for a proximal ureteral stump proved fruitless. There was no leakage of urine from the left renal region, and massage of the left kidney, which was normal to palpation, failed to bring any urine into the field of operation. The accidental opening of the sigmoid was closed with a double row of linen sutures, and, so far as could be seen, there was no evidence of disturbance in its blood supply, although, in the light of later developments, and judging from our previous experience in dealing with the colon and sigmoid, we believe that there was sufficient interference with its blood supply to cause a limited necrosis. The abdominal wound was closed, allowing room for a cigarette drain to the pelvis. Owing to possible infection from the opened gut, we did not explore the right kidney region, but later *x*-ray examination established without question the presence of a normal kidney on that side. The patient made a good recovery, and was sitting up when, on the thirteenth day, a small fecal fistula developed; this closed spontaneously after several weeks. Six months after operation the patent was well.

The pathological report made by Dr. W. T. Councilman, of the Pathological Department of the Harvard Medical School, is as follows: The specimen was received, cut up, and placed in Zenker's and formalin solutions. It consists of a thick-walled, sacculated cyst, probably about 7 to 9 cm. in diameter. The inner surface is brownish in color and velvety in appearance. The partitions between the recesses are thick, with smoothly rounded internal borders. Two pieces contain each a funnel-shaped depression, terminating in a short, thick-walled tube of small calber. The cyst throughout is lined with stratified epithelium similar to, but not exactly repeating, the epithelium of the kidney pelvis. In some places there is but a single layer of cells; in others, a considerable degree of thickening. Back of this epithelium, throughout all the sections, there is a reticular tissue enclosing cells corresponding to small lymphoid cells. In places these cells are aggregated in masses resembling small lymph nodes. Similar aggregations of lymphoid cells are found scattered throughout the tissue at varying distances from the internal surface. The general mass of the cyst wall is composed of dense, fibrous tissue, in which masses of non-striated muslce fiber are embedded. On the interior of the cyst,back of the reticular tissue, the muscle forms an almost continuous wall. Elsewhere the muscle appears in irregular masses, cut at various angles. In the outer portion of the thinner parts of the cyst wall there are numerous hyaline, fibrous masses, in all respects resembling hyaline, obliterated glomeruli. In these places there are a number of ducts, varying in size, and lined with a layer of small cells, with well-staining nuclei. Sometimes the lumen is free; at other times it is filled with hyaline material. In the thicker portions of the wall the tissue is composed of easily recognized renal tissue. In this there are numerous glomeruli, separated from one another by masses of

tubules, cut at various angles. In these places the amount of connective tissue between the tubules corresponds to that of the normal kidney. The tubules, however, do not show the normal differentiation. Most of them are lined with a low, rather irregular, epithelium. Here and there, however, tubules can be found with an epithelium corresponding to the convoluted tubules. There are, also, numbers of rather small tubules with an epithelium corresponding to the convoluted tubules, and here and there the Henle tubules can be recognized. In most of these places the lumina of the tubules are free. This tissue corresponds to that of the normal kidney, except that the glomeruli are relatively fewer in number and there is not the same differentiation in epithelium. Throughout the wall in all the sections there are great numbers of thick-walled blood-vessels, both arteries and veins, and large numbers of small nerve bundles. The whole structure closely corresponds to a hydronephrotic kidney with great atrophy of renal tissue and, in places, with tubular hyperplasia.

There are various types of anomaly of the kidney, some of which, such as absence of one kindey, horseshoe kidney, fusion, double pelvis, etc., are well known and recognized in the living. A supernumerary kidney, however, appears to be much less common, and on this account it seems worth while reporting our case.

In 1904 Pohlman,[1] of Baltimore, in his article on "Embryology of Kidney Anomalies," suggested a satisfactory explanation for the development of supernumerary kidneys, although he did not report an illustrative case of his own.

Normally, in the development of the embryo, the renal bud arises dorsally on the Wolffian duct after the duct has reached the cloaca, and at a short distance from its point of entrance. The Wolffian duct is of mesodermic origin and is the first portion of the excretory system to make its appearance. The buds, two in number, grow dorsally and lie close together, each being capped by a specialized mesodermic tissue, the renal mesenchyme. Each bud divides into an upper and a lower sprout at some distance from the Wolffian duct, and the two sprouts go to form one kidney. The kidney wanders upward from a position in front of the second sacral vertebra, rotates at the midlumbar region, and finally reaches its normal height at about the end of the second month. The kidney becomes vascularized after it reaches its normal height. In the development of supernumerary kidneys (which occurs before the third month) each sprout on one side or the other, or on both, is surrounded by an independent mass of mesenchyme, forming one or two supernumerary kidneys, as the case may be.

According to Quain, the occurrence of a third kidney is extremely

[1] Amer. Med., 1904, vii, 987.

rare; it is placed either in front or on one side of the vertebral column or in the pelvic cavity. Sometimes the third kidney may be united to one of the others.

The following cases bearing on this subject have been reported:

Newman,[2] in 1898, had seen only one instance of a supernumerary kidney. That was found at a postmortem examination on a male subject who had died from malignant disease of the colon. It consisted of a small, pear-shaped body lying close to the upper margin of the left kidney; its blood supply was furnished by a branch of the renal artery. It had a distinct ureter, which passed into the left ureter half an inch below the pelvis of the left kidney. Sections of this mass examined microscopically showed healthy renal tissue. The mass was completely distinct from the kidney proper, being united to it only by the little ureter.

Debierre[3] related a case, recorded by Gavard, in which three kidneys were situated against the lumbar spine, the ureter of the central kidney opening into the ureter of the right kidney. He thinks that this was a case of complete division of the right kidney. No further particulars are given.

In 1899 Cheyne[4] reported a case of movable third kidney. An hysterical woman, 22 years of age, complained of indefinite abdominal pain and indigestion. During the attacks of pain she noticed a diminution in the quantity of urine passed. On physical examination, a tender swelling was found below the umbilicus, behind the right rectus, at the brim of the pelvis; irregularly flattened, nodular, and somewhat, but not freely, movable. It could not be felt by pelvic examination. At operation the tumor was found to be retroperitoneal, resting on the right side of the lower lumbar vertebræ and on the brim of the pelvis. When exposed, a normal, lobulated kidney presented. Both flanks were examined carefully and normal kidneys were found on both sides of the vertebral column, the left being somewhat smaller than the right. The well-developed third kidney had its own ureter and blood supply and lay about three or four inches below the right kidney. It was replaced without fixation, as the tearing necessary to expose it would, it was thought, cause adhesions enough to hold it in place. The patient made an uninterruted recovery and reported herself at the end of a year relieved of all her symptoms. A diagnosis of the condition was not made before operation. The question of a movable kidney was ruled out on account of the position of the tumor and the fact that it could not be pushed into the loin. The symptoms were thought to be due to the mobility and to the slight pressure on or kinking of the ureter.

Bartlett[5] reported a case of supernumerary kidney under the

[2] Malformations of the Kidney, Clin. Soc. Trans., 1898, xxxi, 118.
[3] A Case of Movable Third Kidney, Lancet, 1899, i, 215.
[4] Ibid.
[5] A Pathological Curiosity (Supernumerary Kidney), Lancet, 1904, i, 124.

heading, "A Pathological Curiosity." At an autopsy two kidneys were found on the left and one on the right side. The two on the left were fused together, one being above the other. The two ureters on the left arose separately from two distinct pelves and continued separately to the bladder, one entering the bladder one-quarter of an inch above the other. On section a distinct demarcation of the two kidneys was not visible to the naked eye. All three were normal in appearance. They had no connection with the cause of death. He states that a supernumerary kidney is very rarely met with. He regards it as an extreme instance of segmentation of the kidney. The most typical arrangement is in serial order with the kidney on the same side, but entirely separate. It has its own vessels and duct, but the duct may be fused with that on the same side or remain separated.

Tschudy[6] in 1902, reported a case of complete double formation of one kidney; the upper portion was formed by a separate pelvis, which was distended and septic; this emptied into a thick, infected separate ureter; the lower half was formed by a normal kidney, with its normal ureter. The parenchyma in the upper half had disappeared, because of the pressure of the pelvic abscess; it showed microscopic remnants of parenchymal substance at the hilum. The stenosis of the ureter lay at the vesical end. The patient survived operation.

TENDON TRANSPLANTATION AND NERVE ANASTOMOSIS.

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TENDON TRANSPLANTATION.

Tenoplasty, or tenontoplasty, according to Hoffa,[1] of Berlin, was first conceived and employed by Nicoladoni, in 1882, and has now become one of the most important operations in the whole field of orthopedic surgery. This operation in latter years has been much talked about, although it was invented and tried in single cases at a much earlier period. Arthur W. Elting,[2] in an extensive review of the subject, states that Duplay, in 1876, transplanted tendons. A short history of the operation may be quoted from H. Augustus Wilson,[3] who says, "that in 1892 Parrish, of New York, reported a

[6] Ueber einen Fall von Doppelbildung der linken Niere mit Pyonephrose des einen Nierenbecken Harnleitersystems, Cor. Bl. f. Schweiz. Aerzte, 1902, xxxii, 400.

[1] Amer. Jour. Arthop. Surg., August, 1904.

[2] Albany Med. Jour., April, 1902.

[3] Amer. Med., April 8, 1905.

case, the first in America. The same year, Drobnik proposed periosteal insertion of transplanted tendons. In 1894, Winkelman published and analyzed 16 cases. Since 1894, Goldthwait, of Boston, and others have perfected the methods. In 1898, F. S. Eve reported 274 operations, and Vulpius, in 1899, gave his experience in 160 cases. In 1902, Lange introduced artificial silk tendons, following the example of Glück, who, in 1892, had used bundles of silkworm gut to bridge the gap, after division of tendons in injuries. Kummell, in 1896, found that the strands ultimately became converted into fibrous tissue."

The indications for the operation are as follows: Cases in which function is faulty, because of ill-directed voluntary movements, aiming to restore the balance of power as far as possible; in traumatic loss of function of muscles and tendons; spastic paraplegia; infantile paralysis, and congenital deformities.

Vulpius,[4] of Heidelberg, says that tendons may be transplanted in three ways: (1) We may simply freshen the paralyzed and healthy muscles at the sides and sew them together. This method is rarely used, because of the weakness of the scar. (2) We can unite a healthy tendon as a whole with a paralyzed one, or total transplantation. This is only done when the sound muscle has an unimportant function. The peripheral portion of the sound tendon is then attached in an upward direction to a neighboring tendon of similar function. In this way, the function of the sound muscle is not lost. (3) We may take a slip from a sound tendon and insert it in a paralyzed one. The paralyzed tendons may be treated in three ways: (1) We may cut them entirely and turn them upward to the sound tendons; (2) we may divide them and attach a slip to the healthy tendon; and (3) we may leave them intact and unite them in some way to the sound tendon.

The old operation, as performed by Nicoladoni, united tendon with tendon. A modification of this has been instituted by Lange, who does a periosteal transplantation, that is, he unites the sound tendon to a point on the periosteum of the bone to which the paralyzed tendon is attached. He claims two advantages for this method. He thinks that with the old method the paralyzed tenddon will stretch, thus causing insufficient tension and failure; and further he claims a free choice of insertion for the tendon. Some surgeons, notably Vulpius, do not agree with this view. They claim that the paralyzed tendon does not stretch, and that Nature's insertion of tendon cannot be improved upon. Wolff places the tendon in a bony canal, and Müller has even conducted a tendon entirely through a bone. In order to insert tendons in the periosteum, they often have to be lengthened. This necessitates a lengthening by silk strands, thus making a false silk tendon. This was recom-

[4] New York Med. Jour., September 10, 17, 24, and October 1, 8, 1904.

mended and successfully used by Glück. The threads afterward become enclosed in a fibrous deposit which is mixed up with tendon fibers until finally a new tendon is built up with a central core of silk threads. According to experiments made by Lange, we know that the young tendon tissue creeps along the silk threads, as along a lattice. He has shown that in sufficiently old artificial tendons, the tissue penetrates into the inside of the silk threads. There is an interlacing, so to speak, and finally the silk threads lie embedded in the newly-formed tendon. There has also been observed a condition in which only a connective-tissue regeneration takes place, and there is formed a kind of tendon sheath in which the silk glides, as the working tendon. The most important duty of the silk tendon is to retain the body of the transplanted tendon at a proper tension, to prevent its retraction and shrinkage, until the young tendon has gained sufficient firmness to undertake the work itself. The tendon sheath is not regenerated, therefore it should be spared as much as possible in operating. The tendon preserves a grayish-white color, a sign of a more scar-like constitution. There are additional tendinous bands formed from irritation and extension of the inflammation; but, on the whole, the transplanted tendon heals into position perfectly without much reaction in itself.

An important point is the amount of tension to be obtained: too much injures the muscles, while too little interferes with the action of the tendons. When tendons are carried for some distance for the purpose of transplantation, tunnels must be made for them through the tissues with a blunt instrument. These tunnels or canals should be as straight as possible, as an angular tunnel interferes with the power of traction. Results are better and are seen sooner if the transplanted tendon is kindred in function to the paralyzed tendon. In order to achieve good results, four conditions are necessary, namely, (*a*) perfect asepsis; (*b*) prevention of hemorrhage; (*c*) healthy muscle material, and (*d*) union under certain tension.

The paralyzed muscle, says Koch, undergoes more or less fatty degeneration, and these fatty deposits occur in continuity or at intervals. It is noteworthy that accompanying this fatty degeneration there is always a regeneration taking place. Upon this fact rests the recovery of the paralyzed muscle. We can transplant with success only such muscles as possess some power of regeneration. The American surgeon, as a rule, uses only red or pink muscle, but the Germans will use yellowish-red or even quite yellow muscle, on the ground that they do at times ultimately regenerate. It is of the greatest importance that the muscle ransplanted be united with the other tendon under sufficient tension. In anterior poliomyelitis, both the elasticity and the tone of the muscle are lost, but there still remains the power of regeneration. This alone, however, does not suffice to bring back the muscle tone. We must, therefore, by the

operation restore the elasticity and tone, and this can only be done by shortening the muscle itself. This is the essential factor leading to good results. The word tension is here used in the sense of overcorrection, and not strain.

Hoffa has done some original work in tendon grafting. He has transplanted the trapezius to the position of a paralyzed deltoid in shoulder-joint paralysis. He has changed the action of the pronator radii teres by transplanting it from the internal to the external condyle of the humerus, and thus overcome the pronation of the forearm. Muscles and tendons that have had their function changed from extension to flexion, pronation to supination, and vice versa soon work very well in their changed order. The brain cells become accustomed to the new order of things in a surprisingly short time. If the mental intelligence of the patient be good, the functional result will be better than if the mental condition be of a low grade.

In 1902 James K. Young and James A. Kelly,[5] of St. Mary's Hospital, Philadelphia, reported 2 cases. In the first case, one of talipes calcaneus, following infantile spinal palsy, the tendon of the peroneus longus was implanted into a paralyzed tendo Achillis. The latter tendon was divided obliquely; its two cut ends were then shortened and stitched together with interrupted fine silk sutures, except at a point in the middle of the cut. Through this opening the tendon of the peroneus longus was carried and stitched in place with interrupted sutures of fine chromicized catgut. The sheath of the tendo Achillis was then stitched together and the wound closed. Ten weeks after the operation, the brace worn was discarded and the patient showed very good results. In the second operation the tendon of the extensor proprius hallucis was implanted in the tibialis anticus, for talipes equinovalgus. Good results followed after two and a half months.

In 1903, Royal Whitman,[6] of New York, called attention to the importance of supplementing tendon transplantations by other procedures designed to assure stability and to prevent deformity, otherwise, the results would be on the whole disappointing. It is, of course, evident that tendon transplantation should be most effective in the slighter grades of paralysis. It is particularly indicated in paralysis of the anterior leg muscles, with consequent lateral distortion of the foot and slight toe drop. Whitman has performed the following operation for such a condition: First, an arthrodesis of the astragulonavicular articulation, that is, the cartilage is removed from the opposing surfaces; then the extensor proprius hallucis is divided near the great toe, drawn through a hole bored in the navicular and sutured to itself and the periosteum, to insure sufficient tension and hold the foot in the normal position.

[5] International Clinics, 1902.
[6] Amer. Jour. Orthop. Surg., August, 1903.

The tibialis anticus is shortened to the same degree, and the tendo Achillis is divided if necessary. The foot is then placed in a position of slight adduction and put up in plaster-of-Paris for two months or longer. The patient uses the foot in walking as soon as possible.

In paralysis of the calf muscles, the peroneal tendons are attached to the os calcis after arthrodesis of the ankle-joint. In paralysis of the peroneus brevis, causing varus of the foot, the extensor hallucis should be attached to the cuboid bone, and the foot fixed in abduction.

In 1904, John Dane and David Townsend, of Boston, reported the after-results of fifty tendon transplantations. The majority gave poor results, but this was probably due to a poor selection of cases.

Dr. Hans Spitzy,[7] of Graz, Austria, reports a case in which a new tendon was formed for the hamstring tendons. A silk tendon had been made, and in three years it was as large as the finger. In one case, in which the tendon was too long, a piece was removed and examined microscopically. There was found to be an intertwining of the fibers.

In April, 1906, Phil Hoffmann and Sydney I. Schwab, of St. Louis, reported an interesting operation for cerebral palsy, involving the flexors and extensors of the forearm, dating from a few days after birth. There was good power in the upper arm. The insertion of the biceps into the radius was cut away and it was inserted into a longitudinal slit in the bellies of the palmaris longus and the flexor carpi radialis, which had been previously detached from the inner condyle of the humerus. These muscles were paralyzed and were simply used as passive structures because they were long and slender and acted as a long tendon. The tendons of these two muscles were cut from their insertion at the wrist and sewed en masse to the tendons of the deep and superficial flexors, including the thumb. The pull of the biceps is now transmitted through these two muscles to the fingers. The patient can hold a fork and spoon, and can lift a five-pound flat-iron and hold it for thirty seconds. He wears a splint to hold the wrist in an extended position, so that his new flexors can act to good advantage. An arthrodesis of the wrist will later be performed.

Much of the success of tendon grafting depends on the after-treatment. After such an operation, the limb should be immobilized in a plaster-of-Paris cast from four to six weeks. After the removal of the cast, the part should be enclosed in splints for six months. During this time, massage, electricity, gymnastic exercise, and baths should be made use of. The longer and more careful the after-treatment the better are the final results.

[7] Med. Fortnightly, April 10, 1906.

Tendon transplantation is not a cure-all. When Nicoladoni's enthusiasm reached the clinic at Vienna much work was done, but it was quickly abandoned, probably because the operation was looked upon as largely curative, and no supplementary measures or apparatus were then used. It is the combination of procedures, taken in connection with the transplantation, which gives the best results.

NERVE ANASTOMOSIS.

Nerve grafting is a step higher than tendon grafting. It is undertaken in order to restore function in incised or paralyzed nerves. There is some doubt as to who first performed the operation. In 1894 or 1895, Charles F. Smith[8] first reported an operation on two horses for laryngeal paralysis. In both cases the proximal end of the spinal accessory was sutured to the distal end of the laryngeal recurrent, with beneficial results to both horses. In 1897, Dr. G. Carl Huber published some experiments on "Nerve Suturing and Nerve Implantation," which gave some improvement in technique. In 1898, Frank E. Peckham,[9] of Providence, R. I., transplanted two branches of the internal popliteal into the external popliteal for paralysis of the extensors of the leg. He says that partial power was restored, but fails to give any details. A second case of like character resulted in a very slight movement of the toes at the end of six weeks. In 1902, Harvey Cushing[10] operated on a case for traumatic facial paralysis. The facial nerve was anastomosed with the spinal accessory. This nerve was divided entirely, thus sacrificing its motor territory. In five months the patient had recovered some use of the facial muscles, at first not coördinated, but afterward they became so. In nine months the electrical response on both sides of the face was practically the same. Cushing says that the first case was operated on by Faure, in 1898, after traumatic injury to the facial nerve. It was unsuccessful, probably owing to the long duration of the injury. The second case was that of Kennedy, who intentionally divided the facial nerve for spasmodic tic, and made an anastomosis, with the same results as those of Cushing.

In 1902, W. W. Keen,[11] of Philadelphia, performed a similar operation at the Jefferson Hospital. He anastomosed a section of the spinal accessory 3 cm. long with the facial, for facial palsy following trauma. Three months afterward the condition was unimproved.

The first case of nerve anastomosis for infantile spinal palsy was performed by James K. Young, of Philadelphia, at the Polyclinic Hospital, in December, 1902.[12] It was reported in February, 1903,

[8] Brit. Med. Assoc., 1894 or 1895.
[9] Providence Med. Jour., January, 1900.
[10] Jour. Mental and Nervous Dis., June, 1903.
[11] Amer. Jour. Orthop. Surg., August, 1904.
[12] Jour. Amer. Med. Assoc., January 21, 1905.

before the Philadelphia Neurological Society, and afterward at the annual meeting of the American Medical Association. In this instance the tibialis anticus muscle alone was paralyzed. The nerves supplying this muscle were inserted into the musculocutaneous. Decided improvement followed, and the patient is now able to walk almost without a limp and she can turn her foot in, which before was impossible.

About two months after this operation Charles H. Frazier,[13] of the University of Pennsylvania, performed a similar operation, with not quite so marked results, but still some improvement was noted. In this case the musculocutaneous was grafted into the anterior tibial nerve.

In 1904, 3 cases were reported by Alfred S. Taylor and L. Pierce Clark,[14] of New York, for facial palsy. They anastomosed the facial and hypoglossal. In March, 1906, they again reported the cases, both one of which had developed motor power on the paralyzed side.

A later operation by James K. Young was reported on May 7, 1906, before the Academy of Surgery of Philadelphia. The external popliteal was grafted on the internal popliteal, for paralysis of the peroneal muscles. In this case sensation was restored in twenty-four hours, and some improvement in the motor power has already been noted.

An operation for quadriceps paralysis has been proposed by Dr. Hans Spitzy.[15] He suggests inserting the long branch of the obturator into the anterior crural nerve.

There are three methods of transplanting nerves: (1) A slip from a sound nerve is inserted in a paralyzed nerve—or central transplantation; (2) the paralyzed nerve may be divided and the distal end inserted into a slit in a sound nerve, or peripheral transplantation of the total central type; (3) a slip of a paralyzed nerve may be inserted in a slit in a sound nerve, or peripheral transplantation of the partial central method. The technique requires all aseptic precautions, and its success depends on the use of small instruments (eye instruments being preferred), and as little handling of the nerve as possible. The distal end of the divided or paralyzed nerve should be secured in a longitudinal slit in the sound nerve by means of several catgut sutures attached, if possible, only to the nerve sheaths. The transplanted nerve should be so placed that its central portion is in contact with the central portion of the sound nerve, and looking in the same direction. The proximal end of the paralyzed nerve should be inserted in a neighboring muscle, in order to prevent the formation of a neuroma. The separation of the sheath is possible in large nerves, but not in the smaller ones.

[13] Med. Record, February 27, 1904.
[14] Jour. Amer. Med. Assoc., March 24, 1906.
[15] Amer. Jour. Orthop. Surg., August, 1904.

Taylor and Clark, of New York, recommended wrapping the junction of the two nerves in cargile membrane to prevent the ingrowth of connective tissue to the field of operation. The wound is then closed without drainage, and the part put up in plaster-of-Paris for from four to six weeks. Afterward, electricity and voluntary movements are cautiously begun. It is said by recent observers that electricity stimulates the fibrillation of the axis cylinders in which consists the final stage of nerve regeneration.

In anterior poliomyelitis, when only one or two muscles remain paralyzed, the operation should be performed after a lapse of about six months. It is not permissible within three or four months after the acute attacks. It is the opinion of most orthopedic surgeons that those muscles which still remain paralyzed after six months are not likely to regain their power. The operation is best suited to those cases in which a few or only one muscle remains paralyzed. Some nerve cells in the anterior horns are so seriously damaged that they are incapable of regeneration. Others are only diseased, and are still capable of partial regeneration, and function will return later to the muscles innervated by these cells. The muscles that remain permanently paralyzed represent nerve cells which have degenerated beyond repair. It is the usual experience that restoration of function occurs in some of the muscles which at first were partially, or even completely, paralyzed. This takes place in a few months after the onset. When only one or two muscles are paralyzed we may expect good results by uniting the nerve supply of these muscles with a motor nerve in the vicinity, as in this way healthy nerve cells are brought in contact with diseased nerve fibers, and the latter may regenerate. The ideal method of anastomosis would be to place the axis cylinder of the divided nerve in relation to and parallel with the axis of the sound nerve.

There are two theories of nerve regeneration: (1) The axis cylinder of the sound nerve grows peripherally into the degenerated nerve. When the centre is re-established, the muscles regenerate, and are again able to do their work, since their degeneration was secondary to that of the nerve. (2) The regeneration takes place from the sheath of Schwann. This is not generally accepted.

According to Spiller, the later investigators have shown that the peripheral stump takes part in the regeneration. It is probable that this regeneration is not permanent unless there is union with the central stump. In answer to the question of how to get proper coördination when the peripheral anatomy is so disturbed, Dr. Spitzy says that the seat of coördination being in the brain, it is possible, when a peripheral nerve is paralyzed, that another centre may take on the function of the paralyzed one. There are many ways for the impulses to come from the different centres, and it is possible for the centres to be re-educated to the new work which they have to perform. Dr. Harvey Cushing adds the theory that new centres

may be developed in children, but not in adults. There we have an education of the old nerve centres to do the different work.

When the operation is successful, decided advantages will have been gained over tendon transplantation. In the latter the muscles that have been diseased are thrown out of function entirely, and use other muscles to perform a function that heretofore they have not been called upon to do. Nerve anatsomosis restores the function of the paralyzed muscle and leaves all other muscles intact.

The future of the operation can only be speculated upon. The careful selection of cases is the most important element of success. However, from results already obtained we cannot but feel that the future has probably in store for us many surprises which may lead to gratifying results, especially in the treatment of anterior poliomyelitis.

THE PLEURAL PRESSURE AFTER DEATH FROM TUBERCULOSIS.

A PRELIMINARY STUDY.

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The existence of a minus or negative intrathoracic pressure was first noted by Carson in 1819. The subject was later discussed by Donders,[1] who established the figures for this pressure and gave the variations in pressure occurring with inspiration and expiration. Hutchinson, Heynsius,[2] Perle and others have made investigations along this line, so that the existence of a negative intrapleural pressure may be considered as proved. This negative pressure is due to the fact that the lungs are constantly distended and the elastic fibers of the lungs are constantly striving to regain a condition of non-tension. Hence, the amount of intrapleural pressure under normal conditions would show the amount of the elastic tension of the lung. This distention of the lung and its tendency to become smaller is well shown by the collapse of the lungs when the chest is opened, either during life or after death. It is because of this condition of a negative intrapleural pressure that a pneumothorax occurs when the lung ruptures or the chest is perforated from without.

Despite the many publications upon the subject only one reference could be found which attempted to explain the origin of the intrapleural negative pressure. Landois[3] states, "that until birth

[1] Physiologie des Menschen, Leipsig, 1859.
[2] Archiv f. d. gesammte Physiologie, 1882, xxix, 265.
[3] Text-book of Human Physiology, Blakiston, 1904.

the airless lungs lie collapsed (atelectatic) in the chest cavity, and fill it so that pneumothorax is not produced if the thorax be opened in a dead fœtus. Even in children who have lived for eight days and breathed normally, the lungs do not collapse when the pleural cavity is open, but remain in contact with the chest wall. It is only after further growth that the thorax becomes so large that the lungs must expand under elastic tension; only then will opening of the thorax cause the lungs to retreat into a smaller volume." This explanation seems to be in accord with the anatomical and physical conditions present. The theory of West that the layers of pleura are held together by cohesion are as two panes of wet glass does not seem tenable.

There are several methods by which the intrapleural pressure can be studied. Thus, Donders, Hutchinson, Perle, and others connected a manometer with the trachea of the cadaver, and measured the pressure produced by opening the chest cavity. This pressure was, of course, positive, and showed the elastic tension of the lungs. Likewise it was a measure of the negative pressure within the pleura. The pressure thus found is supposed to represent the pressure that obtains at the end of quiet expiration. Donders believed that beside the elastic tension, which is measurable after death, there existed during life a condition of pulmonary tone which made the lung tension, and accordingly the negative pleural pressure greater. To prove this he fastened a tube connected with a manometer in the trachea of a healthy animal and killed it by suffocation. As soon as the manometer was at zero the chest was opened, and the pressure from the lung contraction noted. The manometer was left attached and after a short interval of time it was noted that the pressure had diminished one-fourth. This loss in pressure Donders thought to be due to the disappearance of the pulmonary tone. In eleven cadavers examined by him he found a pressure varying between 30 and 70 mm. of water. As the lung in all these cases showed more or less disease, Donders assumed the normal lung would show a greater pressure. He estimated that the normal lung at the end of expiration would show a pressure, due to elastic tension alone, of 80 mm. of water. To this must be added one-fourth, or 20 mm. water, due to pulmonary tone. Thus, according to Donder's estimate, the normal healthy lung in life would show a tension of 100 mm. water, or 7.5 mm. Hg., at the end of quiet expiration. Quiet inpiration increases this tension to 9 mm. Hg., and forced inspiration probably to 30 mm. Hg. While these figures of Donders are quoted in all text-books, it will be noted that they are not based upon experimentation. This method was carried out by Perle,[4] who estimated the pressure in 100 cadavers.

Adamkiewicz and Jacobson[5] attempted to measure the intra-

[4] Archiv f. klin. Med., 1869, vi, 1.
[5] Centralbl. f. d. med. Wissenschft, 1873, 483.

thoracic pressure by inserting a cannula into the pericardium, while Heger and Spehl[6] made a pericardial fistula through which they studied the pressure in rabbits. Luciani and Rosenthal[7] estimated the pressure by means of a sound inserted in the œsophagus. D'Arsonval, in 1877, and Fredericq, in 1882, measured the pressure by inserting a hollow needle into the pleural cavity. The majority of these experiments were done on animals. Because of the disturbed respiratory rate from the attachment of the apparatus, the results on living animals were found to be untrustworthy. Therefore, even the figures given of animals are not those present during life. In the human being during life puncture of the interspaces is the only possible way to learn the intrathoracic pressure, and because of that this method was adopted in the present study.

The observations here reported were made upon subjects after death at the Henry Phipps Institute as a part of the study of the pleura and its behavior in tuberculosis. The method employed consisted in the insertion of a hollow needle, which was connected with a mercury manometer, into each of the five interspaces. This was done before the body had been touched by the pathologist. All examinations were made within twelve hours after death; one or two while the body was yet warm. When the pressure was negative the needle was pushed still further into the chest to find, if possible, the pressure condition within the lung. The punctures were made anteriorly along the anterior axillary margin. The skin was pulled as far as possible to one side and the pressure made through the tense tissue. The return of these tissues to a natural position acted as a valve to prevent ingress of air after the needle was removed.

The results here given will have to stand by themselves, as it has been impossible to find a record of a similar investigation. Besides, the result of the pressure study it has seemed advisable to give also a tabulated list of certain deformities, such as spinal curvatures and displacement of the heart, and the symptoms of pain and dyspnœa.

The total number of cases examined was 23. Of these, 17 were males and 6 females. As to age, there were 2 between fifteen and twenty; 5 between twenty and thirty; 8 between thirty and forty; 7 between forty and sixty; and 1 of sixty-three.

Pain in the chest was present in 14; absent in 7; not noted in 2. Dyspnœa was present in 18; absent in 4; not noted in 1. Spinal curvature was present in 7; absent in 14; not noted in 2. The apex beat of the heart was outside the midclavicular line in none; in the midclavicular line in 13; inside the midclavicular line in 8; not noted in 2. Retraction of the left chest anterior was present in 9; absent in 11; not noted in 3. Retraction of the right chest anteriorly was present in 8; absent in 13; not noted in 2.

[6] Archiv de biologie, 1881, 153.
[7] Archiv f. Physiologie, von du Bois-Reymond, 1880.

The frequency with which depression is found above and below the clavicles is too well known to require comment. It was likely that it was present in every case. Our former history records this fact under the heading of, "Difference in Depression above Clavicles." This was greater in the right in 10; on the left in 1; equal in 10; not noted in 2.

The conditions found at autopsy are of especial interest. The two important things in the present study were height of the diaphragm and the extent and distribution of the pleural adhesions. In a later communication the condition of the lung will be dealt with. The diaphragm was found at the fourth rib once on the left; at the fourth interspace 4 times on the right, and 4 times on the left; at the fifth rib 9 times on the right, and 7 times on the left; at the fifth interspace 8 times on the right, and 7 times on the left; at the sixth rib none on the right, and twice on the left; at the sixth interspace 1 on the right, and 1 on the left; at the seventh rib 1 on the left. In 1 case the pleura was adherent to the diaphragm on the right side, and the level was not obtainable. It will be noted that in the greater majority of cases the diaphragm was found between the fourth and the fifth interspaces. This was the condition in all instances on the right side except 1—a case of pneumothorax. On the left side in 18 cases the diaphragm was between the fourth and the fifth interspaces. In the 2 left-sided pneumothoraces and 1 right-sided pneumothorax it was below. In 1 instance it was found at the fourth rib on the left.

The number and distribution of the pleural adhesions were as follows:

The left lung showed adhesions of greater or less extent over the upper lobe in every instance. The left lower lobe was more or less adherent in 8 cases; free in 15. Over the right lung the upper lobe showed more or less adhesion in 21 cases; free in 2; right middle lobe adherent in 11 cases; free in 12; right lower lobe adherent in 10 cases; free in 13.

In this series the upper lobes of both sides showed pleural adhesions to be practically constant, while in more than one-half of the cases the lower lobe was free.

The results of the puncture of the interspaces were as follows: On the right side the first interspace gave a minus pressure in 8; a plus pressure in 3; a zero pressure in 11 out of 22 cases. The second space gave a minus pressure in 10; a plus pressure in 2; a zero pressure in 11. The third space gave a minus pressure in 14; a plus pressure in 2; a zero pressure in 7. The fourth space gave a minus pressure in 14; a plus pressure in 3; a zero pressure in 2.

It will be noted that as we go down the chest the number of cases showing a minus pressure steadily increases, and at autopsy it was found that the number of adhesions decreased. The same conditions were generally present on the left side where the results were as follows:

The first space showed a minus pressure in 7; a plus pressure in 3; a zero pressure n 13. The second space showed a minus pressure in 7; a plus pressure in 2; a zero pressure in 14. The third space showed a minus pressure in 9; a plus pressure in 3; a zero pressure in 11. The fourth space showed a minus pressure in 13; a plus pressure in 2; a zero pressure in 8. The fifth space showed a minus pressure in 18; a plus pressure in 1; a zero pressure in 3.

The majority of cases with obliterated pleura showed a zero pressure when the puncture was made through the adhesion. In a few instances a minus pressure was obtained. This apparent discrepancy was due, in all probability, to a difference in the character of the adhesions. An obliterated pleura may be a complete adhesion of the two layers throughout, or it may be an adhesion consisting of a multitude of attachments which show like a network when an attempt is made to separate the layers. The interstices between this network are of varying size, and if the needle chances to enter one the elastic contraction of the lung will produce a negative pressure.

The cases showing a positive or plus pressure require special mention. In all there were 8 cases which showed a plus pressure in one or more interspaces.

Case No. 4021 was an acute right-sided pneumothorax. This gave a positive pressure of 6 mm. Hg., except in the second interspace where it was zero. The pressure obtained upon the left was peculiar. On tapping the first interspace there was found a pressure of minus 2 mm., which changed to plus 3 mm. when the needle was pushed further inward. In the second space the first pressure was minus 3 mm., changing to minus 1 mm. In the third space the pressure was minus 2 mm., changing to plus 4 mm. Below this the pressure was zero. At autopsy there was found a right-sided pneumothorax. The pleural cavity contained only a very small amount of fluid. The lung was collapsed. A band of adhesion was found in the second interspace where the zero pressure had been found. On the left side the pleura was adherent as far down as the fifth rib.

Case No. 4272 was an acute left-sided pneumothorax. There was a positive pressure of 10 mm. throughout the left side. On the right side the pressure was zero in the first interspace; minus 8 mm. to minus 3 mm. in the second; minus 8 mm. to minus 3 mm. in the third; minus 8 mm. to zero in the fourth; minus 6 mm. to zero in the fifth. No adhesions were present on the right side. The upper and middle lobes showed œdema, anthracosis, and a few scattered tubercles. The lower lobe showed in addition a large area of tuberculous bronchopneumonia at its apex. There was 1000 c.c. of clear fluid in the left chest.

In this connection it may be well to mention Case No. 4630, with left-sided pneumothorax of longer duration. The diaphragm was

pushed down to the seventh rib on the left side. A minus pressure of 4 mm. was found in the first space, and minus 2 mm. in the four lower spaces. On the right side the pressure was zero in the four upper spaces, and minus 6 mm. to zero in the fifth interspace; minus 3 mm. to zero in the sixth interspace.

Only 1 case was found with positive pressure throughout both sides of the chest. This was Case 3948. The patient had reached a condition of quiescence when he suddenly died of hemorrhage. The pressure on the right side was found to be plus 4 mm. in the four upper interspaces and plus 5 mm. in the fifth interspace. On the left the pressure was plus 4 mm. in the first space, zero in the second, plus 8 mm. in the third, plus 8 mm. in the fourth, minus 12 mm. in the fifth interspace, which quickly changed to plus 2 mm. as the needle was pushed further in. At autopsy there was found a clot in the trachea, with marked emphysema. Adhesions were present on the right side only over the apex. The left side was completely adherent except at the point where the minus pressure was found in the fifth interspace.

Case No. 5025 showed a positive pressure in the first and fourth interspeces on the right side. Elsewhere, both right and left, a minus pressure was found. As the abdomen seemed unusually distended, the punctures were repeated after the abdomen was opened and a zero pressure was found instead of the plus pressure. At autopsy the pleura was found to be obliterated on the right side, while the left was free, except for a small adhesion at the apex posteriorly.

Case No. 4197 showed a plus pressure of 4 mm. in the first interspace on the left. In the second, third, and fourth interspaces the pressure was zero. In the fifth interspace it was minus 9 mm. On the right side the pressure was zero in the first and second interspaces; minus 6 mm. in the third, minus 8 mm. in the fourth. In the fifth space the pressure was zero, and fluid was obtained.

Case No. 4243 (death from acute pneumonia), showed on the right side a plus pressure of 2 mm. in the second interspace; zero in the third and fourth spaces; plus 3 mm. in the fifth space. On the left there was minus 7 mm. in the second interspace and zero in the interspaces below. At autopsy the right lung was free of adhesions, while the left was adherent to the fourth interspace. The left lung was consolidated practically throughout, while the right was congested with areas of bronchopneumonia. Clinically it was difficult to distinguish this case from one of pneumothorax, because of the hyperresonance and marked subjective symptoms.

The behavior of the minus pressures is interesting when compared with the figures given as normal by Donders. As already stated this author fixed the normal minus pressure at 7 mm. Hg. at the end of quiet inspiration in the living individual. After death he thought it diminished one-fourth, due to the loss of pulmonary tone,

or to about 6 mm. In this series of 23 cases a minus pressure of 8 mm. or more was found in one or more parts of the chest in 19 cases. It was found to be minus 16 mm. or more in 8 cases. The greatest negative pressure found was in Case No. 3119, amounting to minus 24 mm. From this it would seem if the figures given by Donders are correct, that the intrapleural tension may be greatly increased locally or generally in pulmonary tuberculosis.

From these 23 cases certain preliminary deductions are justifiable:

1. In subjects dead of tuberculosis pleural adhesions of greater or less extent are practically constant over the upper lobe. The lower lobes are free in about one-half the cases.
2. The intrapleural pressure may vary in the different interspaces of the same chest. This variation is most often due to pleural adhesions which obliterate the pleural cavity at the point of tapping; less often to the lung condition.
3. The intrapleural pressure varies widely in different subjects—from minus 24 mm. in Case No. 3119, to plus 10 mm. in Case No. 4272.
4. The intrapleural pressure may be negative or minus, while the pulmonary pressure is positive or plus (Case No. 3948).
5. The minus intrapleural pressures found in tuberculosis subjects are much increased when compared with text-book standards.
6. Zero pressures are found in one-half the cases in the first two interspaces.

A STUDY OF NORMAL LIVING ANATOMY IN EARLY LIFE.

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AND
Arial Wellington George, M.D.,
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Our knowledge of both the normal and the pathological anatomy of human beings has heretofore depended almost entirely on the postmortem findings. These findings, although of great use, especially under normal conditions, have never been so complete as is called for, regarding the different stages of development by both physicians and surgeons in their special work, when they are called upon to diagnosticate these conditions, and in the case of pathological conditions, to treat them.

Still greater difficulties arise when we attempt to determine the true pathology of the various diseases, for in many instances we are

dealing only with terminal results which may, by representing the terminal lesions of a number of diseases, especially the different infections, fail to give us the early and truly characteristic lesions of the special disease.

Any means, therefore, by which we can recognize a disease in its early stages, whether it be an effusion in the pericardium or the pleura obscure centres of pulmonary solidification, an osteomyelitis or a clinically hidden fracture, is of extreme value, and, indeed, a necessity, according to our modern ideas of diagnosis for treatment. This means, more or less perfected, has been given us by the Röntgen method, and the knowledge derived from this method, showing us the actual living condition, is becoming more and more extensive and exact.

Like many other methods of diagnosis, however, of which the technique is difficult, discredit has been thrown upon the value of diagnosis by the *x*-rays. This arises not only from the many failures, and, consequently, poor results from lack of skill in carrying out a difficult technique, but also from the almost ridiculous interpretation of the plates by those whose knowledge in no way fits them for this expert work.

There is no doubt whatever that when the technique is carried out, and the Röntgengram read, by experts, wonderful and reliable results can be obtained, giving us an exact knowledge of the internal organs as well as of the skeleton in both normal and pathological conditions.

Granting that the Röntgen method can accomplish this for us, we must allow that a thorough knowledge of living normal anatomical conditions should be acquired before we can rightly understand what we see in pathological conditions and recognize intelligently the lesions of the various diseases during life.

It would be a comparatively simple matter if we could merely study the normal living anatomy of the fully developed adult, and, of course, such a study is necessary and is very important. This living, fully-developed anatomy, however, is merely one link, in fact almost the last one of the much more extensive and complicated chain of evidence which enables us to diagnosticate normal anatmoical conditions through all their stages of development in early life. It is during early life that manifold changes take place continuously, and the younger the individual the more rapid are these changes. A knowledge of the living anatomy of each period of growth for comparison is, therefore, of the utmost importance as the necessary preparation for the recognition of anomalies, of congenital conditions, and of the various diseases. What the study and use of the Röntgen-rays accomplishes is to give us a large part of living anatomy and pathology at either an early or a late period of development of disease, and thus enable us to decide upon the nature of the disease long before, as, in the past, the findings on the postmortem table can be made use of.

Even anatomists know very little regarding the different stages of the many changes which take place in the growth of early life, the appearance and development of the centres of ossification, and the appearance of the zone of proliferation at different ages, yet without this knowledge we cannot intelligently treat many diseases.

In order to aid the practitioner to overcome the difficulty which arises in attempting to memorize the many and rapidly changing anatomical conditions at different periods of development, we have thought it worth while to prepare a series of plates which can be referred to when any especial period of development is being studied for purposes of diagnosis and treatment. Of the many important changes which normally take place in different parts of the body and from which distinct truths can be deducted in studying them by the Röntgen method, probably the most important are those which take place in the zone of proliferation. We merely speak of this as an example of what this method of study may lead to, for it certainly must be far-reaching, and it opens up so many questions of future research that it would be impossible in a paper of this kind to more than suggest them. In this area of ever-changing growth, many infections take place which may greatly affect the future growth and usefulness of special parts.

The various congenital deformities can be especially studied in the epiphyses of the long bones—notably chondrodystrophia. Again, the diseases of nutrition attack the zone of proliferation, notably in rhachitis. Again, how important are the anatomical conditions of these parts in studying the secondary infections which attack them, notably tuberculosis, measles, typhoid fever, and the various pyogenic infections.

The epiphyses are the most important centres of the skeleton, for on them depend its future development, especially in infancy and chi dhood, and when these centres are impaired there results far-reaching influences in later life. A thorough knowledge of the different changes which take place in even this small area is very important, for these centres are where disease may begin, from which disease may disseminate, and where it may lead to disastrous consequences and may leave its permanent marks.

Very little is known of the etiology of the diseases of nutrition and the especially important rhachitic conditions which play such a great role in early life, and we also have a comparatively slight knowledge of its early stages. A more exact knowledge, obtained by the Röntgen-rays, of the normal development of these parts may lead to the recognition of more definite etiological facts regarding this disease and all other diseases connected with nutrition.

In rhachitis, for instance, it will be important to compare the epiphyses and the zone of proliferation at the time when a rhachitic child is examined, with these areas of a normal child of the same period of development. Many interesting questions at once occur

to us—such as, Does the ossification of the epiphyses depend on the size of the child or its age, or on both?

In fact, each of us, whether physician or surgeon, or one who is making some especially careful study connected with anatomy, will find it of great advantage to enter upon his study from the standpoint of normal development.

It is with this idea that we have been making a series of pictures, which, when completed, will represent a table of reference by which

FIG. 1.—Abnormal foot of a child. (Compare with Fig. 2.)

we can compare abnormal conditions with the normal anatomy of the same stage of development.

An instance of how important to the surgeon may be this comparative anatomy in cases of anomaly is shown in Fig. 1. This is the foot of a child of three years. It shows in comparison with the normal foot of a child of three years, as shown in Fig. 2, an abnormal condition. The child was treated for some time by orthopedic surgeons, with bad results. A Röntgengram was then taken and the anomalous condition disclosed.

We shall only show in this paper a few of the series which illustrate certain interesting points and exemplify the value of such a series. The entire series will be published later. There are certain rules which must be followed if a normal anatomical progressive development is to be of practical use to the practitioner. First, it must be understood that we cannot depend on the mere age of an apparently healthy child to determine whether the picture of its organs and bones represents what should be considered the normal

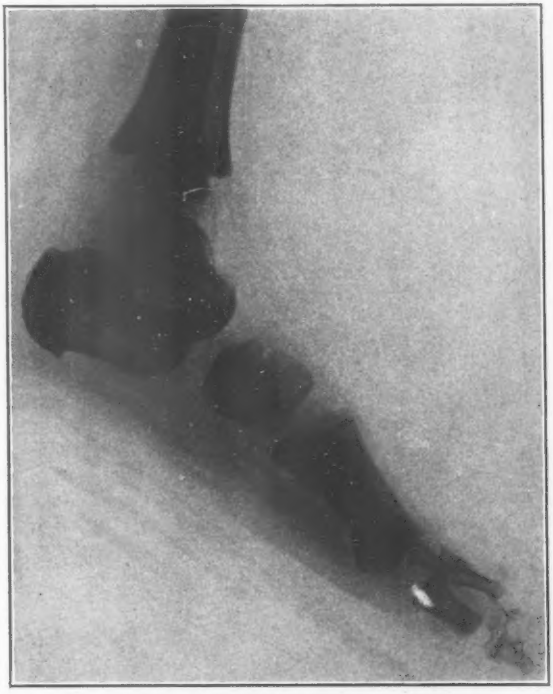

FIG. 2.—Normal foot of a child. (Compare with Fig. 1.)

development at that age. Age is an unreliable standard, unless the normal development as to weight, height, the teeth, the fontanelles, and other external evidences of healthy growth are taken into consideration. It is, therefore, necessary first to make a careful physical examination of a number of children selected as representing the normal physical conditions of a certain age, and then to choose by means of the Röntgen method those pictures which show the average development at that age, and take this average as our standard.

There should also be a special standard technique in connection with these pictures. The tube should be in all cases at the same distance from the part taken, and the part should be in the same position in all cases. This will give us a standard of comparison, which it is very necessary to have for a critical diagnosis, and espe-

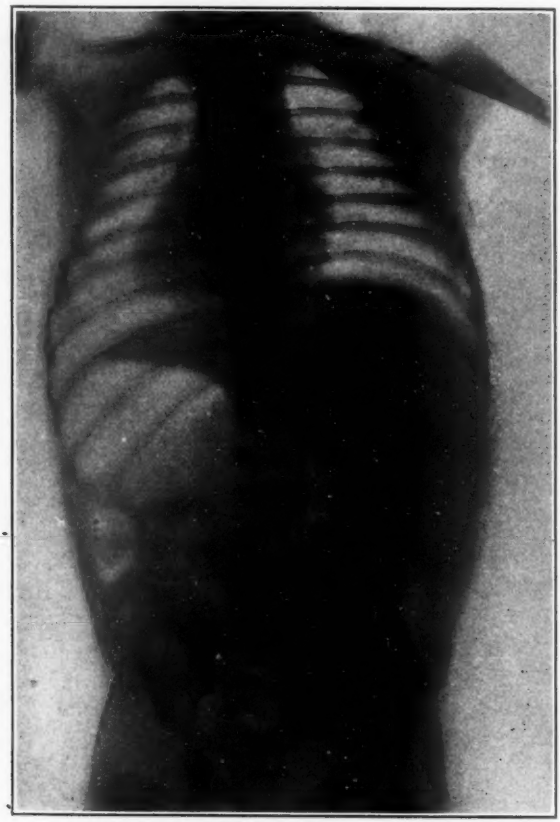

FIG. 3.—Showing the organs, especially the height of the diaphram and the cardiohepatic angle.

cially for exact work on operative cases. It should also be expressly stated in connection with each plate whether the picture is of actual size or reduced or enlarged, and how much. A series of this kind, extending from premature life to adolescence, will give the practitioner exact information of the most varied and important conditions of normal comparative development at a period of growth

when such changes are most rapid, and a knowledge of them of infinite value for diagnosis and treatment.

In such a series one should note especially the shape and size of the heart, the cardiodiaphragmatic angle, so useful for a differential diagnosis between cardiac enlargement and pericardial effusion, the different centres of ossification in connection with the development of the epiphyses, the zone of proliferation, and the size and position of the stomach, liver, spleen, kidneys, and bladder.

FIG. 4.—Centres of ossification in the hand at two and one-half years of age.

In looking at the Röntgengram which represents the heart in one of these pictures (Fig. 3) it will be seen that the diaphragm is quite distinct and that the recognition of its angle with the heart in a doubtful case of pericardial effusion would aid us very greatly in differentiating a normal or dilated heart from the effusion. In this series of pictures it is worth noticing that the centres of ossification are absent at first, then gradually appear as small plates, and finally assume their normal size. Figs. 4 and 5 show the changes in the centres of ossification in the hand, which take place at two and one-half years, and six years, respectively.

Finally, we would emphasize the fact that however important has been the precise knowledge of anatomical conditions studied after death, yet as supplementary to such knowledge, a knowledge of

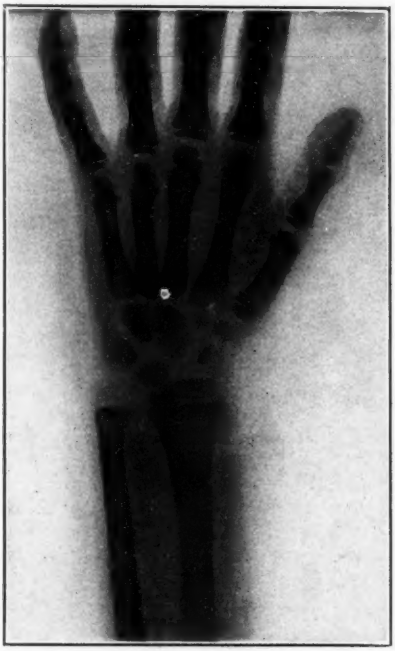

FIG. 5.—Centres of ossification in the hand at six years of age.

actual living conditions in a special individual is far more important and practical for the practitioner of medicine.

The work upon which this paper is based was done at the Children's Hospital, Boston.

THE USE OF AMMONIUM OXALATE IN BLOOD-CULTURE TECHNIQUE.

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RECENT investigations in blood-culture work on special cases of infectious diseases (typhoid fever, for example) indicate clearly the necessity of making blood cultures according to more than one

method.[1] The routine blood culture on a few media is a relatively easy matter; more elaborate methods cannot be employed with ease at the bedside of a patient, in either the hospital ward or private house. A complete cultural study of the blood requires a considerable outfit, the sight of which in certain cases excites fear in the patient and occasionally interferes with the asepsis necessary for the success of the culture. Apart from this minor consideration, the coagulability of the blood constitutes at times a real difficulty, and puts certain limitations on the work. It necessitates a rapid and complete distribution of the blood in the various media employed, and thus prevents its further manipulation and study. When a small quantity of blood is withdrawn from the patient (as may happen in cases with poor peripheral circulation, or in children) a uniform distribution of the blood is even more difficult, and the culture must at times be incomplete. Furthermore, the coagulability of the blood adds to the bactericidal action of its serum and is thus detrimental to the growth of bactera in positive cases.[2] It is, therefore, necessary to make the bedside procedure simple.

With this object in view, I introduced the use of a solution of ammonium oxalate, in conjunction with our routine blood-culture work, by means of which some of the blood withdrawn is kept fluid, taken to the laboratory, and studied in any manner desirable. Thus the results obtained by the latter method were controlled by those obtained in the cultures made in the usual way. The present article comprises a description of the method and a preliminary report of the work done thus far.

The solution employed in this method is made up of the following ingredients: ammonium oxalate, 2 grams; sodium chloride, 6 grams; and distilled water, 1000 c.c. The resulting solution is distributed into large test-tubes in quantities of 10 c.c. each (measured accurately by means of a pipette or measuring funnel), and sterilized on three consecutive days, twenty minutes at a time. The level of the fluid in the tubes may be indicated by some mark; this serves to control the evaporation of the fluid. The tubes are then stored in the cold until needed. It is best to make up fresh solutions every three or four weeks, as the oxalate is likely to undergo decomposition.

It is obvious from the above figures that the solution is approximately isotonic with the blood. The choice of ammonium oxalate as a decalcifying agent of the blood is based on some previous work in connection with the sterilization of blood,[3] in the course of which we found that the oxalate was satisfactory for the purpose and

[1] Libman, Johns Hopkins Hosp. Bull., July, 1906.

[2] Conradi, Münch. med. Woch., Nr. 34, 1906; Müller and Gräf, Münch. med. Woch., Nr. 2, 1906.

[3] Bernstein and Epstein, Jour. Infect. Dis., 1906.

exhibited (in the quantity used) no apparent detrimental influences on the viability or growth of bacteria.

The steps of the method are as follows:

1. About 10 c.c. of blood is withdrawn from a chosen vein, and
2. Introduced into a tube containing 10 c.c. of the sterilized ammonium-oxalate-saline solution.
3. The mixture is then shaken thoroughly; or, better still, poured into another sterile tube. The blood stays fluid. It is then taken to the laboratory and treated according to any or all of the methods suggested for blood-culture work.

The quantity of ammonium oxalate employed is really in excess of the needed amount. This is done so as to permit the use of larger amounts of blood than indicated above.

The above method has thus far been employed by us in 78 cases, taken from various patients. The results obtained with the ammonium-oxalate method have been the same as those obtained with the controls. The bacteria encountered in our positive cases were the pneumococcus, streptococcus, staphylococcus, as well as the typhoid bacillus and Bacteruim coli. The phenomena exhibited by these bacteria in our control cultures (inclusive of the typhoid-type colony)[4] were the same as those obtained in the cultures made by the oxalate blood.

The introduction of this method in blood-culture work is intended as an intermediate step, whereby the preparation and work at the bedside may be reduced to a minimum; also to facilitate more extensive study of the blood than is possible with our present methods. In addition to the ease with which blood-cultures can be taken by this method, it offers other advantages. The oxalated blood may be centrifugated, and spreads may be made from the sediment and examined microscopically for bacteria. In intense infections an early diagnosis can thus be made. The supernatant fluid obtained by centrifugalization can be employed for the determination of the opsonic index of the blood.

So far we have not had any experience with the application of this method to the attenuated organisms, such as the diplococcus and streptococcus[5] of subacute endocarditis. Our series of cases has, as yet, been too small to prove conclusively that the method may be used safely in every case. Further studies of the method, however, are being carried on in our laboratory by Dr. Ryttenberg, the results of which will appear in a publication by him.

[4] Epstein, Proc. New York Path. Soc., Oct., 1906.
[5] Libman, loc. cit.

REVIEWS.

AMERICAN PRACTICE OF SURGERY. Edited by JOSEPH D. BRYANT, M.D., and ALBERT H. BUCK, M.D., of New York City. In eight volumes. Vol. II, pp. 778, with 213 illustrations. New York: William Wood & Co., 1907.

THE contents of the second volume of the *American Practice of Surgery*, which follows the first after an interval of about six months, are classified by the editors thus: Part VI, miscellaneous semi-surgical diseases, including leprosy, plague, glanders, anthrax, etc. (Leys); VII, tuberculosis (Gibney), and syphilis from a surgical standpoint (E. L. Keyes, Jr.); VIII, abscess (Jonas), ulcer (Mastin), gangrene (A. C. Wood); surgery of the skin (Douglass W. Montgomery), of muscles, tendons, bursæ, etc., (J. Clark Stewart), of nerves (Willard), and of lymphatics (Dowd); IX, burns, etc., (Tilton), and frostbite (Paul M. Pilcher); X, wounds of the soft parts (Darnell), and gunshot wounds (Borden).

It is gratifying to see the literary reputation of the medical departments of our Army and Navy so well sustained by Leys, Darnell, and Borden, in the present volume. They have proved themselves worthy successors of the lamented Lidell, of Bill, Otis, Wales, Brinton, and other military and naval surgeons of the past.

Leys discusses the various semi-surgical affections which have acquired increased importance from their frequency in the remote corners of our overgrown republic. Perhaps his remarks are a little too extended, but he writes from a full mind; and particularly to be commended are his clear, dogmatic, and complete sanitary directions for prophylaxis.

Surgical tuberculosis is treated by Gibney. He maintains the frequency of primary pulmonary lesions, and again asserts his belief that whooping-cough is a prime predisposing factor in the production of bone tuberculosis. He regards scrofula or struma as a disease due to inoculation with bovine tuberculosis, and recognizes it as a predisposing cause of bone and joint disease.

Keyes discusses syphilis in an *ex cathedra* manner, frequently substituting in undecided questions a dogmatic opinion of his own for a lucid exposition of facts from which an intelligent reader might draw his own conclusions. He gives a cheerful prognosis except for alcoholics. He condemns iodides and inunctions of

mercury in the treatment of syphilis, and thinks hypodermic injections of mercury the only proper form of administration. His own preferences would probably be more cordially adopted were his ill-tempered and oft-repeated sneers at the general practitioner less prominent.

Jonas's clinical description of abscess is good; but we unreservedly condemn his treatment of *acute* abscess by curetting the abscess wall after incision. This practice is responsible for more spreading inflammations than is the original focus of infection itself. An acute abscess tends to spontaneous cure after evacuation, and even massage and kneading of the surrounding tissues are injudicious and likely to spread infection. The use of carbolic solution for moist antiseptic poultices is in our opinion of very doubtful expediency. The danger of gangrene from carbolic acid poisoning is by no means imaginary, and according to some experiences is more frequent with the feeble solution (2 per cent.) which he recommends, than it is with solutions of greater strength. We much prefer a dressing soaked in equal parts of alcohol and corrosive sublimate solution (1 to 2000), and having had extended personal experience of these two forms of treatment, can truthfully say we never saw so many infected wounds and spreading inflammations in an equal space of time, as in the service where carbolic acid was used.

The article on gangrene and gangrenous diseases fills 100 pages. It is too long; it is, however, comprehensive and exact, but it is not systematic. Repetitions are frequent, and unnecessary space is thus consumed. It is an ambitious article, but cannot satisfactorily be presented to the reader in abstract. It has apparently been the author's endeavor to cover the literature of the subject thoroughly, and to this end he seems to have abstracted nearly every article, even remotely related, which could be found in the Index Medicus. Unfortunately no discrimination is shown, those of no value (and they are many) being quoted as fully as those few from which the reader may be expected to derive some benefit. The author's personal experience with gangrene appears to have been confined to a single case; but with commendable industry, which might well be imitated by other surgeons with a dearth of clinical material, he makes it do duty, (1) as gangrene due to arteriosclerosis (p. 214); (2) as diabetic gangrene (plate xii); and (3) as emphysematous gangrene (p. 252); and all within the confines of this one article. Dr. Wood's descriptions of traumatic or emphysematous gangrene and of hospital gangrene are particularly graphic. Perhaps this is to be attributed to the fact that they are taken bodily, with little verbal change, and with no credit, from the pages of Ashhurst's *Surgery*.

Dr. Douglass W. Montgomery, of San Francisco, contributes an elaborate article, covering nearly 100 pages, on the surgery of diseases of the skin. It is a pity that anthrax, glanders, actinomycosis,

etc., are included here, since they have already been treated very ably and at quite sufficient length by Leys. Among the many rare affections of the skin described, we find no mention of pilo-nidal cysts and fistulæ. The section on skin cancers is especially worthy of notice; the clinical descriptions of the course of the disease show the value of prophylaxis, and prove how inefficacious all palliative treatment eventually is; and his insistence on excision as the safest remedy might well be heeded by the hordes of practitioners and quacks employing the Röntgen rays and cancer pastes as therapeutic measures.

The concluding subjects are the most important in the volume, and the articles are in every way worthy of their titles. Too much praise can scarcely be bestowed on Major Borden's monograph on gunshot wounds. We consider it one of the most valuable contributions on the subject in the English language for the last twenty years. His article is cyclopedic, systematic, exact; his mind has a firm grasp of the subject, and he presents his ideas in an orderly and intelligible manner. He shows the difference between modern military wounds and those of civil life, the latter more nearly resembling the military wounds of the Civil War, and requiring immediate removal of the bullet, which lodges in the vast majority of cases. The wounds of modern war, however, made by the small, jacketed bullets of high velocity, seldom if ever require immediate operation, the missiles rarely lodging, and being very nearly aseptic when they do. He gives the credit for introducing this revolution in the treatment of gunshot wounds on the field of battle to von Bergman, who, as is well known, in the Russo-Turkish War of 1887, made the daring experiment of treating fifteen soldiers with gunshot wounds of the knee-joint by an occlusive dressing, instead of by immediate amputation of the thigh, which had been the recognized treatment since the days of Guthrie. The mortality from the latter treatment had always been over 50 per cent.; but only one out of von Bergman's fifteen patients died. It appears to be true, nevertheless, that the main element in bettering the ultimate prognosis in gunshot wounds is due rather to the modern missiles than to any improvement in surgical treatment; and it also seems that the few instances in which prognosis is worse now than formerly are due to the more lethal effects of modern missiles on structures where their explosive effect is apparent.

This is a large volume, and has many of the faults of the previous volume, which was recently reviewed in these columns. The articles are, with the few exceptions noted, not cyclopedic; they are ill-balanced; they overlap each other to an unwarranted degree. For these faults we think the editors are as much to blame as the authors. For the improvement in the letter press, and for the decrease of the faults mentioned, the editors are to be commended.

A. P. C. A.

DISEASES OF THE NERVOUS SYSTEM RESULTING FROM ACCIDENT AND INJURY. By PEARCE BAILEY, A.M., M.D. Pp. 600. New York and London: D. Appleton & Co., 1906.

SEVERAL years ago Dr. Bailey published a book called *Accident and Injury in their Relations to the Nervous System.* In the present work he attempts a treatise on all traumatic affections of the nervous system. If his views are to be accepted, most diseases of the nervous system may be due to trauma. This is an interesting fact and the natural query is, Why should not injuries to the chest and abdomen cause diseases of the heart, lungs, stomach, liver, and other organs? Surely if a nervous disease can be caused by a blow or an injury of some kind, should not a similar injury to the body cause disease of the internal organs? Possibly the author, when speaking of the different diseases, had in mind the literature, and not his own views. However that may be, he speaks of progressive muscular atrophy, and he includes in this disease amyotrophic lateral sclerosis, paralysis agitans, and multiple sclerosis as being due to trauma. Most neurologists will not agree with him that amyotrophic lateral sclerosis and progressive muscular atrophy are the same thing. These diseases are coming to be regarded more as the result of a lack of development of the cerebrospinal axis, an abiotrophy, the symptoms coming on in the early or in the latter part of the patient's life. Trauma may be the exciting cause of the appearance of the symptoms, but hardly the cause of the disease. The author s views that both paresis and tabes cannot be produced by trauma alone are sound, and he justly considers injuries only as a contributory cause. He favors lumbar puncture as a diagnostic measure in intermeningeal hemorrhage.

When speaking of the diagnosis of head injuries, he states that certain conditions of the pupils seem of particularly grave significance, and that he has noticed high mortality in cases with persistent and equally contracted pupils, with immobile pupils, and with pupils presenting alternating contraction and dilatation. Again, when speaking of compression of the brain, he states that among the early symptoms the pupils are contracted at first, and are unequal, the larger pupil generally being on the side of the compression; later the pupils are dilated and do not respond to light. These are the general rules he says, though subject to many exceptions. These facts are important. In the perusal of most textbooks, the descriptions of the pupillary phenomena are very vague, and practically no two books agree as to what the conditions of the pupils are in injuries to the brain and skull.

The author's views on the causation of insanity as a result of injury are sound, and his treatment of injuries to the spinal cord is excellent. His convicrion is against the existence of concussion of the spinal cord, but with this opinion some neurologists would be inclined to disagree.

The second part of the book is concerned with the so-called traumatic neuroses; this is the best part of the book. The descriptions of traumatic hysteria and neurasthenia are excellent, and his treatment of these subjects is good. In the last part, he takes up the medicolegal considerations and malingering. The book on the whole is excellent, a credit to the author, and should be read by everyone interested in this subject. T. H. W.

A Text-book of Pathology. By Alfred Stengel, M.D., Professor of Clinical Medicine, University of Pennsylvania; Physician to the Pennsylvania, University, and Philadelphia Hospitals. Pp. 977; 399 illustrations in the text, many of them in colors, and 7 full-page chromolithographic plates. Fifth edition. Philadelphia and London: W. B. Saunders Co., 1906.

To all those who are interested in pathology, and indeed in clinical medicine as well, this book is very familiar, and since from one edition to another the changes have doubtless been followed, it is entirely superfluous to comment upon the work in general. The fourth edition appeared in 1903. The arrangement of the present edition does not differ materially from the last edition, but very considerable change has been made in the subject matter. Many additions have been made to the part on general pathology, and in some chapters, such as the one on animal parasites, the matter has been in places recast. New matter has also been added to the chapters on retrogressive processes, inflammation, and regeneration, and to that part of Chapter VII which deals with the problems of immunity. In Part II, which is devoted to special pathology, changes and additions are also noticeable. With these alterations and the new illustrations, the book has been enlarged about fifty pages. It remains as it always has been, a most useful book. W. T. L.

Diagnosis of Organic Nervous Diseases. By Christian A. Herter, M.D. Revised and enlarged by L. Pierce Clark, M.D. New York and London: The Knickerbocker Press, G. P. Putnam's Sons, 1907.

This little book, of nearly 700 pages, is the revised edition of the earlier work of Dr. Herter; Dr. Clark revised the present edition. The scope of the book has been somewhat enlarged and its title has been changed to the present one. It is an excellent book for the student of medicine. The arrangement of the text is different

from that in other compends, in the fact that the different subjects are treated according to symptomatology.

The diagnosis of the different nervous diseases is constantly kept in the foreground, and little space is devoted to treatment. It is difficult to criticise the subject-matter in a book like this, in which only a bare outline is given of symptoms and principles. It seems, however, that there is too much repetition of old theories and methods. For instance, the motor centres have been placed both in front and back of the central fissure, and it is presumed from the text that the sensory functions are localized in the same areas.

Again, when discussing the effects of lesions of the inferior parietal lobe, ptosis is mentioned as a probable symptom. No mention is made of stereognostic function as being localized in the parietal lobule. When speaking of the tumors of the brain, the authors state that syphilitic and tuberculous intracranial growths are more common than other varieties. This does not agree with the experience of other neurologists who believe that sarcomas are the most common. On the whole, the book is a good one, and deserves the reputation it has made for itself. T. H. W.

TUMORS, INNOCENT AND MALIGNANT: THEIR CLINICAL CHARACTERISTICS AND APPROPRIATE TREATMENT. By J. BLAND SUTTON, F.R.C.S., Surgeon to and Member of the Cancer Investigating Committee of the Middlesex Hospital, London. Fourth edition; 355 engravings. Chicago: W. T. Keener & Co., 1907.

WITH the first publication of this book its usefulness was immediately recognized. One edition followed another in rapid succession, and now in the fourth we find many valuable additions. This new matter includes a short account of the prevailing theories as to the origin of cancer, additions to the section upon chorion epithelioma, chapters upon tumors of the ovary and testes, and a chapter upon heterotopic teeth. Of these additions perhaps those of most interest generally are the chapters upon tumors of the ovaries and testes. These chapters are excellent. As regards the cause of cancer the author makes no definite statements. Three hypotheses are discussed—the embryonic, the parasitic, and the biological—but the author's view of the whole question is summed up well in the last sentence of this chapte· when he states that "whilst investigators are hunting for the cause of malignant tumo s practical surgeons have to deal with the concrete disease." Indeed, this sentence may be taken to typify the book, for it is e sentially practical and of real use to the surgeon. Minor alterations have been made throughout the volume and a number of new illustrations have been added.

We still find the chapters upon cancer of the breast, a subject of enormous interest and practical importance to the surgeon, strikingly inadequate. The chapters upon tumors of the thyroid gland is also very disappointing, but in spite of a few shortcomings it is evident that the book, good at the start, improves with each edition.

W. T. L.

A Manual of Pathology. By Guthrie McConnel, M.D., Pathologist to the St. Louis Skin and Cancer Hospital, and to St. Luke's Hospital, St. Louis, Mo. Pp. 523. Philadelphia and London: W. B. Saunders Co., 1906.

The author's purpose in writing this manual was to condense into a small book for the student important points which receive a broader treatment in most text-books upon the subject. From a book such as this, it is, of course, not possible to study pathology, but for a rapid review of the subject it may be useful. The arrangement of the book is much the same as is adhered to in most of the larger text-books: Part I deals with general pathology; Part II is devoted to special pathology. In the last three chapters of Part I, postmortem technique, laboratory technique, and bacteriological methods are briefly discussed. It is naturally difficult in a book of this sort to include the results of recent investigations, and the author cannot digress from the older classifications of diseased processes; still, with our present knowledge it seems out of place to class pernicious anemia, leukemia, and Hodgkin's disease as diseases of the blood, and to designate the spleen as a ductless gland. Quite a number of illustrations reproduced from the larger books of Durck and McFarland are scattered through the volume. W. T. L.

A Text-book of Psychiatry. A Psychological Study of Insanity for Practitioners and Students. By E. Mendel, M.D., Professor in the University of Berlin. Authorized translation, edited and enlarged by William C. Krauss, M.D. Pp. 311. Philadelphia: F. A. Davis Co., 1907.

This compend was written for the practitioner and the student in Germany, and has been translated for the use of the American student and practitioner. There is no subject in the entire realm of medicine more difficult of presentation than that of diseases of the mind. The science of psychiatry up to the present time has been essentially a science of classification of the symptom groups and

so-called diseases. In the absence of a distinct pathology any distinctive group of symptoms can be considered as a clinical entity. Each author, according to his experience, presents the subject in a simple or more or less complex fashion. As a result of this, it is practically impossible for the reader to get a clear idea of the subject of mental diseases from a text-book, without extensive clinical experience. The specialty as taught to the student leaves him, as a rule, at the time of graduation, with a very confused idea of diseases of the mind. In order to present the subject in such a way that it comes within the grasp of the mind of the student or practitioner of medicine, the author must have an extensive experience with mental diseases. From such a standpoint, no one is better qualified for such a task than Mendel. His very extensive clinical and teaching experience has enabled him to present this subject in a clear, concise, and systematic manner.

In the absence of a distinct pathology, the subject-matter is presented upon a psychological basis. In other words, the book presents a psychological study of insanity. The first half of the book is devoted to a very careful consideration of the symptomatology of insanity. This is divided into a consideration of the disturbance of sensation, sense perception, memory, feelings, emotions, consciousness, actions, speech, and viscera. The contrast between the actions of the normal and the pathological mental states is very clearly shown and gives the student a peg upon which to hang the isolated descriptions, etc. The English at times, is somewhat obscure, but this is to be expected in dealing with psychological states. The term "inheritor," as used to designate those who show neurotic ancestry, does not clearly express what is meant. In other respects, this portion of the book is worthy of the highest commendation. The second half of the book is devoted to special psychiatry. The classification used is as simple as possible for working purposes and at the same time takes into consideration the more recent advances in the subject. The systematic presentation of the different types of insanity, the clear-cut descriptions of the different symptoms, the psychological analysis of the disease as a whole, and the elimination of unnecessary discussion, gives this portion of the book the stamp of a well-ordered mind and one accustomed to the difficulty of teaching insanity. The author's attitude toward such subjects as moral insanity is tinged by his long experience with the forensic side of medical jurisprudence. Not only in connection with the subject of moral insanity, but elsewhere throughout the work, his method of looking at the subject from both the medical and legal standpoint, gives an added value and logical simplicity to the descriptions and analyses. More attention than usual is paid to the subject of hallucinatory delirium. Twilight mental states are also very carefully considered. A short chapter is devoted to the arteriosclerotic psychosis.

It is impossible to imagine more subject matter than is here presented, contained in such a small volume without a loss of clearness of description. It should be recognized by an author of a text-book of insanity that a very extensive work with a full consideration of the many diverse views will neither be read nor understood by the student or practitioner. The reviewer of this book has kept the standpoint of the student in view. The expert in mental troubles will, however, find many things of value, and especially the clear and systematic presentation of a difficult subject.

In the translation, the German text is closely adhered to without, however, any sacrifice of the natural, clear, and direct style. The few illustrations could well be improved upon. Apart from this, the book is well printed in good type and well bound.

In conclusion, particular attention should be directed toward the classification of the different types of insanity and the table of contents. Were it possible to have institutions for the insane adopt this classification, much value from a statistical standpoint could be gained from their annual reports. D. J. McC.

A Handbook of Skin Diseases and their Treatment. By Arthur Whitfield, M.D. Lond., F.R.C.P., Professor of Dermatology in King's College; Physician to the Skin Department, King's College and the Great Northern Central Hospitals. Pp. 320. New York: Longmans, Green & Co. London: Edward Arnold, 1907.

As the title plainly indicates, this is a handbook and not a treatise. The general arrangement of the subject-matter, and indeed the handling of the matter itself, is different from that of the usual small text-book. The contents and the manner of dealing with the entire subject call to mind a similar-sized volume by Pye-Smith, of London, published some years ago, and which was deservedly well received by the profession. Dr. Whitfield has written for the purpose of giving the information he has to convey from his own point of view, and without regard to the traditional style of handbooks. Everything is brief, terse, and to the point. No classification is attempted: this is to be regretted.

Under the head of general therapeutics, it is stated, "apart from the remedies for various well-defined constitutional errors, only three drugs need be considered, namely, arsenic, mercury, and thyroid extract." From this it is obvious that the author is most conservative in the use of drugs. We quite agree with the remark that mercury is often of value in nutritive disorders of unknown nature, and that it is by no means safe to conclude that a skin disease is syphilitic

because it is found to yield to internal mercurial treatment. The chapter on pyogenic infections, together with a description of A. E. Wright's method of treatment, to which the author has experimentally given attention, is both original and interesting, brief as it is.

The "ringworms," so common in London, are elucidated according to recent studies, and Sabourand's teachings largely followed. The Röntgen rays, it is stated, merely remove the hair, but do not cause the death of the fungus. Pityriasis alba, occurring in the scalp in scaly patches encircling the hair, the hair itself escaping invasion, is considered to be due to the "bottle bacillus." This affection the author states is fairly common in England, but in this country it is not generally recognized. Our best recent treatises do not describe it. There is a chapter on "tumors," but the lesion is not defined; some epidermic formations are included here. Ichthyosis, leukoderma, and scleroderma are grouped together in one chapter. The term "syphilide" is employed—rather the better English word syphiloderm, the latter being for every reason preferable.

Sound advice is given for hypertrichosis, which if followed would in the end save the patient both suffering and disfigurement. Depilatories are condemned, the safety-razor being preferable. The Röntgen rays should always be employed with caution.

While there is much in many directions that is original and interesting in the book, therapeutics cannot be designated its strongest feature. Not much is said in general on the internal administration of drugs, nor is the matter of diet strongly insisted upon in diseases in which a dietary really often plays a prominant part in the cure.

There are some good photographic illustrations and photomicrographs of sections, but no attempt is made to illustrate the diseases fully. The style of the author is easy and unaffected, so that one may peruse any page with pleasure as well as profit. L. A. D.

NOTES ON BLOOD-SERUM THERAPY, PREVENTATIVE INOCULATION, AND TOXIN AND SERUM DIAGNOSIS FOR VETERINARY PRACTITIONERS AND STUDENTS. By WALTER JOWETT, F.R.C.V.S., D.V.H., Formerly Demonstrator of Comparative Pathology and Bacteriology in the University of Liverpool. Pp. 200. Chicago: W. T. Keener & Co., 1907.

DR. JOWETT in this little book endeavors to give a short account of the subject of immunity and the vaccines, sera, and toxins used in present-day veterinary practice for the prevention, treatment, and diagnosis of disease. The first chapter deals with the principles of immunity in general. Naturally the matter is condensed into a small space, but even this mere outline of the subject is satisfactory

and sufficiently clear to convey the main underlying principle to the reader. In the second chapter the methods of conferring immunity are reviewed. To each specific disease, such as fowl cholera, anthrax, swine plague, and tuberculosis, one or several paragraphs are devoted. The method of conferring immunity in such diseases as rabies, variola, etc., diseases which the author terms as those due to "ultravisible viruses," are described in Chapter III, while the same system is used, regarding diseases caused by protozoa, in Chapter IV. Finally, in Chapter V toxins and serum diagnosis are considered. The book should be useful to anyone who is interested in comparative medicine and should certainly be read by all practising veterinarians.

W. T. L.

THE MUSCLES OF THE EYE. By LUCIEN HOWE, M.A., M.D., Professor of Ophthalmology, University of Buffalo, Buffalo, New York. In two volumes. Vol. I, Anatomy and Physiology, including Instruments for Testing and Methods of Measurement. Illustrated. New York and London: The Knickerbocker Press, G. P. Putnam's Sons, 1907.

THIS is the first of two large volumes the subject-matter of which is the muscles of the eye. It is undoubtedly the most extensive work in the English language upon the special subject with which it deals. The writer concerns himself equally with the scientific and the practical; from consideration of the normal, the abnormal is deduced by easy and logical steps. He does not simply aim at giving just as little knowledge as is necessary to enable the reader painfully to pick his way through the manifestations of such morbid phenomena as come within the scope of the practising oculist, but he takes up the subject from the scientific stand point very much as a text-book upon one of the physical sciences deals with its subject. Works having the scope of this one are rare in any department of medicine, while those planned upon the ordinary medical text-book method are put forth in abundance. Books like this require profound acquaintance with the literature of the subject which has to be sought in the special publications of the civilized world.

The author tells us in his preface that almost the entire work was submitted to a student who had received hardly more than a high-school education. Any passage not entirely clear to this critic was rewritten or stricken out. This method should certainly render any writing to which it is subjected clear and easy of comprehension. The book deserves, and will no doubt find, a place in the hands of all who are interested in scientific and practical ocular myology.

T. B. S.

A Treatise on the Motor Apparatus of the Eyes. Embracing an Exposition of the Anomalies of the Ocular Adjustments and their Treatment, with the Anatomy and Physiology of the Muscles and their Accessories. By George T. Stevens, M.D., Ph.D. Illustrated with 184 engravings, some in colors. Pp. 496. Philadelphia: F. A. Davis, Co., 1906.

The appreciation of this work is greatly facilitated by considering it separately from the standpoint of anatomy and physiology on the one hand, and clinical and pathological positions on the other. The anatomical and physiological portions, which occupy a considerable part, offer a clear and comprehensive account of the oculomotor apparatus; the clinical portion opens a wide field which has given room for extensive controversy.

The present book is a sequel to the author's work on *Functional Nervous Diseases* published in 1884. That work was of moment in American ophthalmology in emphasizing the role of the external ocular muscles, supposed to be of prime importance in the causation of many obscure nervous affections. The controversies which some of the claims therein made excited and the opposite opinions as to their validity are well remembered. Certain contentions of the author in that work were exaggerations and did not stand the test of time and experience; and although he declares that the present work is intended to promote the development of the central doctrine of the work just mentioned, it departs very considerably both in its claims and conclusions from the earlier work, and, as we believe, decidedly for the better. T. B. S.

Essentials of Obstetrics. By Charles Jewett, A.M., M.D., Sc.D., Professor of Obstetrics and Gynecology in the Long Island College Hospital; assisted by Harold F. Jewett, M.D. Third edition, revised and enlarged. New York and Philadelphia: Lea Brothers & Co., 1907.

This little book serves a useful purpose in enabling the student to distinguish the important portions of the subject under consideration. It is in no sense a quiz compend, but is just what its title indicates—an epitome of obstetrics. It should not be used as a crutch; indeed the, author definitely warns against this—a warning which if taken to heart by the student completely obviates the danger always connected with books of this type. The subject-matter is well and thoroughly covered; a number of additions have been made to this the third edition to keep it abreast of the times. W. R. N.

PROGRESS
OF
MEDICAL SCIENCE.

MEDICINE.

UNDER THE CHARGE OF
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REGIUS PROFESSOR OF MEDICINE, OXFORD UNIVERSITY, ENGLAND,
AND
W. S. THAYER, M.D.,
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A Study of Latent and Recurrent Malarial Infections and the Significance of Intracorpuscular Conjugation in the Malarial Plasmodia.—CRAIG (*Jour. Infect. Dis.*, 1907, iv, 108) gives a most thorough analysis of latent and recurrent malarial infections; by the first (latent), meaning those cases in which the plasmodia may be demonstrated in the blood, but in which no clinical symptoms of sufficient gravity to attract attention are to be observed, and in the latter (recurrent), the appearance of symptoms due to the same group of parasites that caused the original infection. The importance of the latent type is great and amounted to nearly 24 per cent. of the cases examined, and as these cases showed no clinical symptoms and were discovered only in the routine examination, these men might have been sources of infection for other persons for weeks or months. These men were mainly soldiers returning from the Philippines. The latent infections were often associated with other diseases and their importance in treatment was very great aside from the general treatment of the associated diseases. As regards the recurrent infections Craig concludes that in the estivo-autumnal tertian infections relapses occur most frequently between the twentieth and fortieth days after the initial attacks, and in benign tertian infections between the fifteenth and twenty-second day. In the etiology of these conditions Craig believes that intracorpuscular conjugation is very important and plays a great part; it is noted especially in the latter part of the acute attacks and is probably the process intended to maintain the malarial infection in the blood of man; it occurs whenever the races of plasmodia are in danger of dying out from repeated sporulation in the usual manner.

His conclusions are: (1) Intracorpuscular conjugation is the chief cause of the maintenance of malarial infection. (2) It maintains malarial infection by producing a resting or zygote stage of the plasmodia

within the human body which is resistant to quinine and other injurious influences. (3) It is the cause of latency and recurrence of malarial infection, the zygote stage remaining dormant or latent until conditions are favorable when it gives birth to several young plasmodia, thus causing a recurrence of the infection. These conclusions are justified by the following considerations: (1) The presence of the process in all acute and recurrent infections. (2) The fact that during the time consumed in conjugation in all other protozoa, provided the conjugation is asexual, many generations of the organism could have been produced by division or sporulation in the usual manner. (3) The fact that such a resting or zygote stage must exist as proved by the recurrence of the infection after the discontinuance of quinine given for long periods of time. (4) The fact that in cases that have been treated at once with sufficient doses of quinine for a sufficiently long period, intracorpuscular conjugation is never seen and in such cases relapses are very rare, if they ever occur. (5) The presence in cases in which the process is most marked, of numerous large, pigmented bodies in the blood both intracellular and extracellular, which are not seen in cases in which the process is absent. (6) The argument from "analogy," which indicates that the significance of the process of asexual conjugation in the malarial plasmodia is similar to the same process in other of the protozoa.

The Influence of Subcutaneous Injection of Liver Extract upon the Hepatic Metabolism of Uric Acid.—L. B. STOOKEY (*Jour. Med. Research*, 1906, xv, 321) in association with A. S. GRANGER has previously shown that the subcutaneous injection of liver extract (dog) may lead in the same animal to an increased elaboration of nitrogenous end products into urea, and that liver extracts heated to 55° C. were not found to have this stimulating action. Attention was, therefore, directed to the possibility of an enzymotic formation of urea. These same studies were directed upon the hepatic metabolism of uric acid. Stookey reviews the literature bearing on the destruction of uric acid by the animal organism, especially as regards the liver and other organs, and the dependence of destruction on the activity of an enzyme which has been called a "uricolytic ferment." Stookey made extracts from the liver of several dogs, then made daily injections of amounts varying from 10 to 50 c.c., and, at the conclusion of each experiment, the uricolytic power of the liver was determined by hashing the organ finely and estimating the amount of uric acid destroyed in a certain time. Control experiments were made on normal dogs. The results showed a noticeable increase in the uricolytic power of the liver of treated dogs over that of the normal animals.

The Electrical Conductivity of Blood and Urine in Health and in Disease and as a Test of the Functional Efficiency of the Kidney.—DAWSON TURNER (*Edin. Med. Jour.*, 1907, xxi, 318) has been experimenting for some time on the electrical resistance of various kinds of urine in states of health and of disease, and from about 1000 observations, has determined that the observed resistance of normal urine amounts to about 250 ohms in his apparatus. To avoid polarization the estimates were made by means of a wheatstone bridge, with alternating currents, and a telephone, and at a temperature of 65°F. In artificial urines it was found

that the resistance depends only upon the ionic concentration (salts, acids, and bases), and of these NaCl is by far the most important. The resistance for practical clinical purposes can be regarded as being un affected by the presence of albumin, sugar, blood, and oth r non-electrolytes. Turner's tables show these facts very well. In health the resistance is low and the lower it is, other things being equal, the healthier the condition. In certain acute and chronic diseases a very high resistance is found constantly present. In pneumonia, diabetes mellitus (increased resistance possibly depending somewhat on the increased viscosity), kidney diseases, and pernicious anemia, the resistance is high. Turner also found it double the normal during sick headaches.

As regards the blood the average observed resistance in normal persons was about 700 to 900. The resistance depends upon a salt concentration of the blood and the relative volume of the corpuscles to the serum. The greater the salt concentration the lower the resistance, but the greater the number of the red cells present, the higher the resistance. Hence a high resistance of the blood and a low resistance of the urine indicates health. The resistance of the blood in kidney diseases, chlorosis, anemia, and pernicious anemia is low and in the latter may be half that of normal blood. Comparing systematically the resistance of the blood and urine Turner has established a ratio called the "hemorenal salt index," or the ratio of the electrical resistance of the blood to the electrical resistance of the urine. "In health this would be equal to 3, 4, or 5 whole numbers, namely, $\frac{2}{2}\frac{0}{5}\frac{0}{5}=4$. The higher this number the healthier, other things being equal, is the condition of the patient."

If the index increases, it indicates that the blood contains fewer salts or is richer in corpuscles, that the urine contains more salts, and that the functional activity of the kidney is increasing; if the renal index diminishes, the kidney is becoming sluggish and inefficient.

Turner reports upon several diseases and shows an interesting table of 19 different patients. In anemia the blood corpuscles can be allowed for by count and the electrical resistance depends then solely on the nature and amount of salts present. A low hemorenal index will then mean that the blood contains too great a proportion of salts and the urine too small a proportion, or renal inefficiency. The kidney instead of withdrawing salts from the blood and secreting them in the urine is allowing them to be retained in the blood. Turner looks upon an index below 3 as abnormal and below 2 as serious. Surgical interference in kidney lesions is contra-indicated if the index is much below 3. More comparisons of this method with cryoscopy are needed to determine their relative values which have already shown in some instances an agreement. At any rate this is a much more rapid method of clinical diagnosis than cryoscopy while only one drop of blood (5 c.mm.) is required instead of 10 to 20 c.c. for cryoscopy. This determination of the hemorenal salt index is another example of the application of precise scientific measurement to clinical medicine and surgery.

Calcification of the Breast following a Typhoid Abscess.—W. S. THAYER and H. H. HAZEN (*Jour. Exp. Med.*, 1907, ix, 1) report the case of a patient with typhoid fever and intestinal hemorrhage who had taken,

during eleven days, 132 grams of calcium lactate by the mouth as well as 5 grams of calcium chloride subcutaneously. Eleven days after the subcutaneous injection there developed a large abscess of the breast from which Bacillus typhosus and Staphylococcus aureus were obtained on culuture. The abscess was opened and the wound packed with iodoform gauze. Eleven days later a deposit of calcium appeared in the granulation tissue of the wound. This rapidly increased until the rim of the opening and the lining granulation tissue were converted into a hard, calcareous mass. A number of nodules of an apparently similar character appeared in other parts of the breast. A month later, the cavity showing slow improvement, the packing was removed and a simple, plain, protective dressing was used. On the basis of the experience of Gerhardt and Schlesinger, who found that under a carbohydrate-free diet the calcium excretion was increased, the patient was put on a carbohydrate-free diet. Improvement was immediate, the wound gradually healing with the complete disappearance of the calcareous deposits. The patient slowly gained weight and left the hospital in excellent condition.

Attempts to reproduce the picture in rabbits failed. Studies were also made of the intake and output of calcium. On a diet of milk and eggs the patient showed a material calcium retention; during the carbohydrate-free diet there was a considerable excess of calcium elimination over the intake. On a normal ward diet there was a slight retention of calcium. The percentage of calcium eliminated in the urine as compared with that eliminated in the feces was much higher during the periods of carbohydrate-free diet.

With regard to the cause of the calcification Thayer and Hazen say: "We cannot speak with certainty. The remarkable association of the deposition of calcium at the seat of an injection of calcium chloride in an individual who had been receiving large quantities of lactate of calcium by mouth—a deposition occurring in tissues which were in direct connection with or in the immediate neighborhood of a dressing containing iodoform, a poison which in certain animals produces degenerative changes in the kidneys and liver which are peculiarly prone to calcification, is striking and worthy of note.

"In how far the decalcification of the affected area may have been due to the carbohydrate-free regime, with the consequent excessive calcium elimination, it is impossible, on the basis of a single case, to say. The coincidence in time of the disappearance of calcium from the breast with this treatment is, however, remarkable and extremely suggestive."

Anomalies of Respiration in Young Soldiers, Especially as Regard the Apices of the Lungs.—G. H. Lemoine (*La presse médicale*, 1907, x, 73) has been examining men for enlistment in the army and has followed closely later those who showed some slight anomalies of respiration. In most cases excellent results have followed the regular life in camp or barracks which, in some respects, approaches that in a sanitarium. Of 945 men examined, 99 showed some change in the auscultatory sounds. In the first group a change in inspiration was noted under the right clavicle in 64 men, about 6.7 per cent., all of these showing a fixed and persistent diminution in the intensity of inspiration;

14 others showed, in addition, a slight prolongation of expiration. In about 18 of these men there had been a previous pleurisy, and in many there was a family history, of tuberculosis. Their general condition and fitness for work were carefully considered before admitting them for duty, while they were afterward carefully watched and, as soon as untoward signs were manifest, were immediately dismissed for treatment elsewhere. In most instances the men picked up quickly under the carefully regulated life and soon threw off their respiratory changes.

In the second group there were 9 men with some changes on inspiration under the left clavicle, where the inspiration was rough and low-pitched, and at times associated with some prolongation of expiration. Most of these men also improved while in the army. Aside from those men with chronic pleurisy, one showed a "respiratory insufficiency" of the whole lung. He gained steadily in weight and left the service in splendid health.

Thus, of the 99 men showing some pulmonary changes, only 19 had to be definitely dismissed, and all of the others did very well. Lemoine, in his many examinations, has noted that inspiration is stronger on the right in right-handed persons and vice versa for left-handed persons, and that the more the right arm is used the more marked this difference. He asserts that especial attention should be paid to the family history only in those cases with some slight anomalies of respiration, as in 79 men with a family history of tuberculosis, although showing no respiratory changes, only *one* developed tuberculosis, whereas in the 99 here examined, about 19 had to be dismissed.

Examinations should be made three times at a month's interval, and special stress should be laid on the good general healthy condition while in service. On the first appearance of any slight weakness in work or fatigue on exertion, but without any change in the lungs themselves, the men should be immediately dismissed for more careful treatment and supervision elsewhere; but the army life is apparently more hygienic and healthful to most of this class of cases than their crowded life at home, or at work.

Interauricular Insufficiency.—H. ROGER (*La presse médicale*, 1907, xi, 85) asserts that there is a certain number of cases in which all the symptoms, such as cyanosis, dyspnœa, etc., point to valvular heart disease, while a most careful examination reveals nothing definite in the heart or lungs, and reports 2 such cases which he classes as "interauricular insufficiency." The first of these was in a man, aged forty-four years, strong and apparently in good condition. His previous history up to the age of thirty years was negative. At that time he suffered from some acute pulmonary trouble which caused much dyspnœa on slight exertion. Every winter since he had recurring attacks of bronchitis, inducing rapid asphyxia and cyanosis. On admission the patient showed intense dyspnœa and cyanosis and was somewhat asphyxiated. Venesection and other measures were of temporary benefit, but the patient finally succumbed three days after admission. Examination showed severe bronchitis and emphysema of the lungs, and the heart was apparently negative, but on account of the intense cyanosis and the lack of evidence of valvular disease, the diagnosis of a communication between the auricles was made, which was confirmed at autopsy.

In the other case a man, aged fifty-four, was under treatment for a bronchitis associated with an old emphysema. The intensity of the cyanosis and dyspnœa, with an apparent absence of valvular disease, led to the same diagnosis as in the first case—"interauricular insufficiency" The cyanosis quickly reappeared on any violent exertion, especially when coughing. The patient left the hospital in a much better condition, so that there was no anatomical proof of the correctness of the diagnosis.

As regards the cause of these symptoms, Roger found that in his first case the heart, though normal in appearance, allowed water to flow from the right auricle to the left auricle through the valve, but not in the reverse way. And this same fact has been noted constantly when carefully searched for at autopsy, even though there be no apparent connection between the auricles. Thus, the intense cyanosis and dyspnœa could be accounted for by the large mixture of venous and arterial blood, due to the increased pressure in the right auricle as compared to the left, this pressure being caused by the various pulmonary conditions or severe coughing spells. Roger noted no auscultatory abnormalities in the heart in these 2 cases, but says that at times a late diastolic or systolic double murmur may be heard to the left of the sternum. Treatment is usually of only transient benefit and after each attack the recovery is slower and less complete. Roger regards this condition as an insufficiency of the interauricular valve or more simply "interauricular insufficiency."

SURGERY.

UNDER THE CHARGE OF

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Primary Carcinoma of the Appendix.—Zaaijer (*Beit. z. klin. Chir.*, 1907, liv, 239) says that in 2232 cases operated on for appendicitis 18 of the appendices were found to be carcinomatous. He thinks that this number is much too low, since of the 2232 cases only a small part were systematically examined, and by such an examination undoubtedly others like his own two, macroscopically unsuspected, would have been found. He agrees fully with Baldauf that carcinomas of the appendix represent about 1 per cent. of all cases of appendicitis. It is probable that chronic inflammation of the appendix plays an important part in the development of cancer in this organ. Zaaijer says that 33 cases of appendix carcinoma have been found by operation and

only 14 by postmortems. Undoubtedly the greater number of operations for appendicitis, if not the cases of appendicitis itself, occur in the second, third, and fourth decades; so that the frequency of appendix carcinoma is that of this period. Since cancer of the intestine is most frequent in the fifth and sixth decades, we see here support of the view that appendicitis is of etiological importance to carcinoma of the appendix. Zaaijer thinks that the very small cancers of the appendix require from ten to thirty years to become the large, fully developed tumors of the intestine, that is, those giving distinct clinical symptoms. In other words, a cancer of the appendix probably requires about ten years to become a recognized cancer of the cecum. Histologically, so far as they have been investigated, these appendix carcinomas have a very malignant character. The histories of the patients show that the symptoms have been those of a simple appendicitis, usually of a chronic recurrent type, and that their carcinomatous nature has not been recognized until the operation. The fact that about 1 per cent. of all appendicitis cases show carcinoma is an additional reason for operation in appendicitis. When a tumor is found at operation it will probably be a cancer. In doubtful cases a piece should be removed, and if possible examined by frozen section. If the findings are positive, the mass, the mesentery, and the associated lymph glands should be thoroughly removed.

Concerning the Methods of Operation in Obturator Herniæ.—Borszeky (*Beit. z. klin. Chir.*, liv, 1907, 350) says that of the rarer herniæ the obturator is the most difficult of diagnosis. Even when it is incarcerated, only now and then is the diagnosis made. In the presence of symptoms of intestinal obstruction we usually examine the usual hernial orifices, with which we are satisfied. As a rule there is no considerable swelling, so that only by a very careful examination could we recognize it. The external signs depend upon whether it passes completely or incompletely the obturator canal. If it is complete a swelling may appear immediately below the os pubis to the inner side of the femoral vessels, above the obturator internus muscle and covered anteriorly by the pectineus. When it does not pass completely through the canal, it either forces its way between the upper and middle fibers of the obturator externus or between the two layers of the obturator membrane, then remaining behind the obturator externus. It is then covered by two muscles, the pectineus and obturator externus. The thigh should be flexed, adducted, and rotated somewhat outward. If it is not palpable pressure about the junction of the lower and middle thirds of Scarpa's triangle, producing pain, should arouse suspicion of this hernia, especially if it is increased by abduction and internal rotation of the thigh. Rectal or vaginal examination may be of value, as may pain along the obturator nerve. This symptom is not found in all cases, not even in the incarcerated. Borszeky found it mentioned in only about one-third of the reported cases. With a narrow canal or with a sac full of fluid, it will probably not be absent. It loses much of its diagnostic value from the fact that it is caused by other conditions, as the pressure of a perimetritic exudate (Sachs), or a mass in the iliac fossa (Krönlein). In a large number the hernia was discovered at autopsy. Usually incarceration first compels the patient to seek relief. As soon as the diagnosis is made we must choose between reduction by taxis and operation.

The conditions are not favorable for the former; since the hernia cannot be grasped or palpated on account of the overlying muscle, while the canal is so narrow that violent pressure could easily be dangerous. Taxis by the vaginal route, according to Lejars, is also dangerous. The most important question, therefore, is: By which path can we most safely approach the hernia for operation? The external operation has many dangers because of the depth and obscurity of the field of operation and the proximity of the large bloodvessels. Lejars recommends the lithotomy position and an incision from the inner side of the femoral vessels to the tuberosity of the ischium. When the sac is opened the canal is widened and the bowel reduced. If it is gangrenous it is resected, a very difficult operation. The danger of hemorrhage from increasing the size of the canal, due to the involvement of the closely associated obturator vessels, is considerable, but the greatest danger arises from handling the gangrenous bowel by the external operation. It may rupture and the contents invade the peritoneal cavity. The operation done from the inside is much better, and in some cases the operation begun from the outside must be ended as a laparotomy. In some cases the diagnosis of internal obstruction is made, and the laparotomy done to correct it serves for the reduction and further treatment of the obturator hernia.

Rupture of the Lung Without Fracture of a Rib.—SCHWARTZ and DREYFUS (*Revue de chir.*, 1907, xxvii, 765) report a case in which there was contusion of the lung without fracture of a rib. There was no considerable laceration of the lung, but at autopsy there was found evidence of multiple small hemorrhages. This condition explained the intense respiratory phenomena, coincident with the insignificant hemorrhage and comparatively little intrapleural hemorrhage. Schwartz and Dreyfus collected 36 cases of this kind, although they were frequently associated with multiple traumatisms, as fractures of the skull or extremities. While no fracture was discovered in Schwartz and Dreyfus' case, there was found a chondrosternal dislocation of the first two right cartilages. This and the marked ossification of the thoracic cage caused a violent compression of the corresponding part of the lung. The evolution of these small hemorrhages is often, unfortunately, the same as in Schwartz and Dreyfus' case. The contused area becomes a focus of infection with resulting traumatic pneumonia, which carries off the patient.

The prognosis of contusions of the lung is always grave, although in the 29 cases collected by Dionis du Sejour there was 60 per cent. of cures. Of the 7 cases added to this list by Scwartz and Dreyfus 5 died and 1 of the 2 that were cured was doubtful. Death occurs from asphyxia, hemorrhage, or a later complication, as infection. Very often this infection causes a traumatic pneumonia. The symptoms may be very mild and in such a case must be looked for very carefully. Schwartz and Dreyfus believe that very few patients recover. The treatment, unfortunately, is chiefly symptomatic. Absolute rest in that position which gives most easy respiration, should be provided. Hypnotics should be given to calm agitation. If the pneumothorax is increasing, puncture or a pleurotomy is indicated. A very grave emphysema may demand operation, which should be a pleurotomy. Hemo-

thorax likewise may require intervention, the indications for which are the same as for wounds of the chest in general.

Perineal Extirpation of Cancers of the Anus and Rectum.—DELORE and CHALIER (*Revue de chir.*, 1907, xxvii, 784) say that the operation for artificial anus should be reserved for inoperable cases, and that these are being diminished in number as time goes on. Without passing judgment on the sacral method of Kraske, or the abdominoperineal operation, Delore and Chalier believe that the perineal route, or, better, the coccyperineal, suffices in the great majority of cases, if they are attacked early; and that it is available for the anorectal cancers or the cancers of the rectum proper, even the more extensive cases, such as the diffuse cases, the supra-ampullary, certain varieties of the recto-sigmoid cancers. Delore and Chalier have operated on 19 cases, 2 of which were epitheliomas limited to the anus, 6 diffuse anorectal epitheliomas, and 11 cancers localized to the rectum (7 of the ampulla and 4 supra-ampullary); 2 were simply excised without amputation of the anus or rectum. The coccyperineal operation permits the wide and sufficient removal of the growth in the majority of cases, without the mutilation of the Kraske or the dangers of the abdominoperineal operation. A temporary artificial anus was performed in 1 case and gave perfect results. They did not employ it more frequently because of the difficulty in obtaining the patient's consent. They are not in favor of a permanent iliac anus, to obviate the difficulties of an incontinent perineal anus. They believe that the latter is better than a partially continent iliac anus. If the anal cancer is large and extends into the rectum, it will often be serviceable to curette and cauterize the external protuberant portion as a preliminary operation. This will permit more easy and thorough asepsis of the region and closure of the anus at the time of the operation.

The lithotomy position is employed. The incision surrounds the anus and extends forward in the median line a short distance, and backward to the coccyx, which is excised. The rectum with the invaded tissue and the sacral lymph glands are liberated *en masse*. This can be done up to the promontory of the sacrum posteriorly. The rectum is then liberated anteriorly, high up. The vagina can, with care, often be saved. By drawing down the mass the peritoneum is exposed anteriorly and opened with scissors, when gauze is introduced to protect the peritoneal cavity. The sheath of the rectum and the surrounding tissue are then divided, and by a sort of unsheathing of the rectum the mass can be brought down farther. The anterior cul-de-sac of peritoneum is then closed by suturing the cut edge of peritoneum in front to that of the pelvic colon drawn down. The intestine is then cut between forceps, the lower end with the mass is dissected out, and the upper cut end brought down and sutured to the skin about in the position of the normal anus. Iodoform gauze is used for drainage in front of and behind the rectum, and a rubber tube and gauze are introduced into the rectum. The operative mortality in the 19 cases was 10.5 per cent. So far as the late results could be ascertained they were very good as to duration of life. One woman, sixty-eight years of age at the time of operation, was free of recurrence eight years later.

Sarcoma of the Prostate.—PROUST and VIAN (*Annal. des mal. des organ. genito-urinaires*, 1907, xxv, 721) say that Langstaff and Bree, in 1802 and 1806, published the first 2 cases of sarcoma of the prostate. Burckhardt, in 1902, after a careful revision of preceding statistics, furnished a definite list of 24 cases of primary sarcoma of the prostate. Proust and Vian, by a search of the literature and the report of a new case bring the number up to 34. Of these 24, or 73 per cent., were under thirty years of age, and 15 of the 24 under ten years of age. While very rare between thirty and fifty years, it was more frequent beyond fifty years (7 cases out of 34). The symptoms vary markedly, according to the age of the patient; and Proust and Vian make two classes of cases, those under and those over thirty years age. In the old, retention rarely comes on suddenly, as it does in the young. In the old, the symptoms, aside from increased volume, are rather negative. The symptoms of dysuria are less marked than in hypertrophied prostate, catheterism is rarely difficult and is never impossible. The enlargement is much less marked than in the young and is rarely felt in the hypogastrium. It can always be felt in the rectum. In the young, the growth is so rapid that it is soon beyond the resources of the surgeons, while in the old, operation has obtained appreciable results, as far as the duration of life is concerned. The only operation advisable at the present time in the young is the suprapubic. The perineal exposes the patient to infection and sloughing of the tumor. Operation, even in adults, is very grave and difficult. Proust and Vian believe that for tumors of moderate size the perineal path should be selected, while for very large tumors or those projecting into the bladder the suprapubic should be preferred.

Experimental Substitution for the Mesentery.—LANZ (*Zentralbl. f. Chir.*, 1907, xxxiv, 617) says that in consequence of the fact that particles of the thyroid gland experimentally injected into the peritoneal cavity were found later wrapped up in omentum, he attempted to show whether and to what extent the attachmnt of the mesentery could be substituted by omentum, with preservation of the normal intestine. August 3, 1906, in a dog, he divided the mesentery between ligatures for about 3 cm. close to the small intestine. He then inserted a piece of the end of the omentum and sutured it to the whole circumference of the detached bowel. October 9 he reopened the abdomen and increased the separation of the mesentery from the bowel about 9 cm. farther and attached another portion of the omentum to the freshly separated bowel, not around the bowel, but simply by its free edge. November 9 the mesentery was separated 14 cm. farther and omentum substituted. November 30, 25 cm. more of the bowel was detached and attached to omentum. This made 50 cm. of bowel cut off from its normal blood and nerve supply, and now depending upon the substituted omentum. At the time of each operation the freshly treated bowel appeared as a contracted band of a bluish-white, mottled color, while that previously operated on had a normal color and its contractility was completely normal. On March 12, 1907, the dog died, when the 50 cm. of bowel had lived two and a half months, with its omental attachment. It had contracted to a length of 40 cm., while its calibre was narrower than its oral and caudal ends. The serous surface was smooth and shiny throughout.

Macroscopically there was no further difference between the affected and the normal bowel. The following practical application of this experiment was carried out by Lanz: A woman, aged sixty years, was admitted to the hospital, February 22, 1907. She had given birth to twenty-one children, was very senile and cachectic, and had a chronic intestinal obstruction supposed to be due to a cancer of the splenic flexure of the colon. Operation, February 27, showed a distended sigmoid flexure and volvulus and a cancer of the pylorus, which was resected. The transverse mesocolon was so adherent to the greater curvature of the stomach that about 6 to 8 cm. had to be cut through and for several centimeters the colon was completely detached from its blood supply. Resection would have been so dangerous that the omentum was brought up and its free edge employed as a substitute for the loss of mesocolon. April 19, 1907, the patient was in a favorable condition and her weight had increased from 39 to 46 kilograms.

A Simple Method of Operation for Stone in the Ureter.—BARTLETT (*Zentralbl. f. Chir.*, 1907, xxxiv, 621) has proved by operation that stones of moderate size in the pelvic portion of the ureter can be easily located and removed by a new and very simple method. An incision is made through the abdominal wall at the outer border of the rectus muscle. The peritoneum, which is not opened, is displaced toward the median line, until the ureter closely bound to the peritoneum is found. The ureter and peritoneum are so loosely attached to the transversalis fascia that they are easily brought into view of the wound With the ureter grasped between the thumb and finger of the left hand it can be followed throughout its pelvic portion and the stone palpated. When the stone is found it is held between two fingers and pushed strongly against the wall of the ureter. A small opening is made by a sharp knife and the stone extruded and removed from the wound. The opening in the ureter is not sutured. A small rubber drainage tube is introduced to the region of the ureter and brought out of the lower angle of the wound, the rest of which is closed. In 3 cases this operation was completed, each time in ten minutes. The size of the stones varied from that of a bean to that of a hazelnut. In none of the 4 cases was a urinous odor detected in the dressing. The drain was removed in five to six days, and the 4 patients left the hospital, cured, within two weeks after the operation.

The Contributions of Surgery to a Better Understanding of Gastric and Duodenal Ulcer.—MAYO (*Annals of Surgery*, 1907, xlv, 810), from the standpoint of the operating-room results, divides ulcers of stomach into two classes: (1) The indurated or calloused ulcer which can be seen and felt from the outside of the stomach during operation, and (2) the non-indurated mucous ulcer which cannot be identified from the outside. All the positive advances in surgical knowledge concern the first class. Nearly all the failures of surgery are to be found in the second class. The relative frequency of ulcer has been placed at 10 gastric to 1 duodenal. In St. Mary's Hospital, from July 24, 1905, to March 23, 1907, 200 ulcer cases have been operated on. Of these 87 involved the stomach, 98 the duodenum, while 15 were indifferent ulcers of each viscus. The large majority of gastric ulcers involve the lesser curvature

above the pylorus, and extend downward anteriorly and posteriorly in a saddle shape. The typical duodenal ulcer occurs in the upper one and a half inches of the duodenum, and in 96 per cent. of the cases extends upward to or within three-quarters of an inch of the pyloric sphincter. This has led to inclusion of these ulcers with the gastric. A thick-walled external vein best marks the position of the pylorus. The duodenal ulcer occurs well above the common bile duct, with its alkaline secretions. The clinical histories and pathological examinations of removed specimens made it certain that cancer had its origin in indurated ulcers. The topography of ulcer and cancer are the same. Cancer of the duodenum is a rare malady and its etiological relationship is apparently not important. From numerous experiences Mayo looks upon pyloric spasm as an indication of an irritation in some part of the intestinal tract which causes an irregular attempt to close the pylorus and thus prevent the food from entering the disturbed area. At the present time Mayo does not believe that a diagnosis of mucous or other undemonstrated ulcer indicates a surgical operation, unless complications, such as perforation, hemorrhage, or obstruction exist.

Partial Gastrectomy.—FRAZIER (*Annals of Surgery*, 1907, xlv, 950) calls attention to the large number of so-called cases of gastritis in which no definite lesion, such as ulcer, is diagnosticated, compared to the few which reach the hands of the surgeons. He reports a case in which, despite some negative findings, the diagnosis was made of carcinoma of the pylorus probably too far advanced for more than a palliative operation. At the time of operation it was decided to do a partial gastrectomy for the indurated area which was still considered to be a cancer. The patient recovered rapidly and three months after the operation had gained thirty-four pounds. The laboratory diagnosis was gastric ulcer. Frazier says that the lesson to be learned from the statistics he has studied is in the danger of placing too much reliance upon what may be called the refinements of laboratory diagnoses. He doubts that the mortality of excision of the pylorus for benign conditions will be greater than that of gastrojejunostomy. The expectation of life should be greater after the former operation, since the favorite seat, and a common predisposing cause, of carcinoma have been removed.

THERAPEUTICS.

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Amyl Nitrite in Hemoptysis.—CRACE-CALVERT (*Lancet*, clxxii, 4362) considers amyl nitrite to be most valuable in practically all instances of hemoptysis. At first it appears to be madness to give a patient,

with a bleeding vessel, a drug which is a powerful vasodilator, but—even though its action be only transient—it produces such an immediate fall in the general blood pressure, that the pressure at the bleeding point is lowered and there is time for clotting to take place, and the hemoptysis usually ceases almost instantly. Amyl nitrite causes no reactionary pulmonary hyperemia, while adrenalin apparently does, and the former has the further advantage that it does not interfere with coughing and so places no obstacle in the way of the patient getting rid of the effused blood; hence, it lessens the risk of later septic trouble. He uses the drug in 3 minim capsules, one of which the patient breaks, inhaling the fumes as they arise. Warning should be given that the consequent feeling of fulness in the head is of no significance.

Antipyrine as a Sedative in Childhood.—H. N. FLETCHER (*The Practitioner*, 1907, lxxviii, 540) considers antipyrine a powerful and valuable sedative in childhood. Its precise mode of action and the part of the nervous system which it influences are not known. It has not the dulling effect upon the cerebral cells which morphine, for instance, possesses. It does not appear to affect cerebral or motor activity to any extent, but rather to have some selective action in controlling sensory stimuli. He has observed no instance, in a series of several hundred patients, in which a rash or any other ill-effect followed the use of the drug. It is free from the hemolytic action which all the other members of this group unfortunately possess. The cyanosis, for instance, which may follow the excessive use of acetphenetidine or acetanilide, due to hemolysis and the formation of methemoglobin, does not result from the administration of antipyrine. It also has no injurious effect upon the metabolism of healthy tissues. If given in small doses (1 to 2 grains) its employment is almost entirely free from danger, and it needs but to be used to convince one of its efficacy and to cause one to consider it an invaluable ally in the treatment of the nervous disturbances of childhood.

Kephaldol: A New Antipyretic and Analgesic.—EINHORN (*Zentralbl. f. die Ges. Therapie*, 1907, xxv, 57) writes most enthusiastically concerning this new agent. Pharmaceutically it is a combination of citric and salicylic acids, phenetidine, quinine, and sodium carbonate. Its ordinary dosage is from 15 to 75 grains daily. It seems to have few disadvantages since it does not affect the heart untowardly, having the contrary effect of rendering the pulse fuller and stronger, it has no unpleasant action on the kidneys, it does not cause tinnitus, mental symptoms, or disorders of sight, and eruptions are not likely to follow its administration, nor does it disorder the digestive tract. As an analgesic he finds it valuable in the pains of syringomyelia, acute rheumatism, sciatica, neuralgias of various kinds, and even in those of locomotor ataxia. The pains of meningitis and cerebral tumor are unaffected by its administration. As an antipyretic it acts excellently in facial erysipelas and acute rheumatic arthritis. Furthermore, it possesses a marked anhydrotic effect, and when given in doses of 15 grains in the evening, is an active preventive of the night sweats of pulmonary tuberculosis.

Tuberculin in Ocular Tuberculosis.—A. DARIER (*Revue de therap.*, lxx, 37) reports a number of instances of tuberculous ophthalmic conditions of various sorts—iritis, iridocyclitis, kerato-iritis, tuberculosis of conjunctiva, cornea, etc.—in which excellent results have been brought about by means of the injection of tuberculin. He admits that recurrences and relapses are not infrequent, but points out that ocular tuberculosis is a very grave condition and states that a recurrence is a signal for a renewal of treatment. The preparation used is the so-called tuberculin R. and the rule is to employ very small doses ($\frac{1}{3000}$ mg. of the solid substance, 1 c.c. of the tuberculin R. containing 10 mg. of this) at first and if this causes a reaction this quantity is diminished. The injections should be undertaken with thorough asepsis and they only slightly painful. The site of injection may be between the shoulders or the region of the buttocks. The procedure should not be carried out oftener than every two days as a rule, but, when great care is used and the doses are small, daily injections may be employed, the quantity being very slowly increased. If the patient exhibits any rise of temperature the treatment should not be begun, and if the injections cause fever they should be stopped until this symptom has disappeared. If large doses (5 mg.) are employed they should be given not oftener than once a week; such a quantity is, however, seldom necessary. In the event of the employment of subconjunctival injections these should be given with the greatest care only and never before a long preliminary course of the ordinary hypodermatic injections.

Radiotherapy in Tinea.—BUREAU (*Gaz. méd. de Nantes*, xxv, 157) considers that the *x*-rays are our most efficient means of treatment in ringworm of the scalp; they accomplish cure in three or four months while other methods often take two or three years. The technique is as follows: Each lesion is exposed to the rays, in a position six inches distant from the centre of the tube. The time of the exposure is that necessary for a pastille of barium platinocyanide placed at a distance of about three inches to assume the color "B" of the radiometer of Sabourand Noiré. The exposed region becomes entirely epilated in from fifteen to eighteen days. The hair begins to grow again, about eight to ten weeks later, and is complete in from three to four months.

The Iodides in Cardiac Conditions.—BARIÉ (*La quinz. thérap.*, 1907, vii, 543), during the period of loss of compensation in cardiac disease, advises the use of digitalis, but after compensation has been re-established prescribes the iodides. These are advantageous from three standpoints: their vaso-dilator action, their effect in lowering blood pressure, and their so-called antisclerotic power. The elimination of the iodides is rapid and takes place through various channels and, although the treatment may be continued for months, iodism seldom results. Certain patients, however, possess an intolerance which is impossible to conquer. The iodides are indicated in arteriosclerosis, angina pectoris, and coronary arteritis, as well as in valvular affections. They are also beneficial in affections of the heart muscle, such as myocarditis and the succeeding sclerotic conditions. Especially are they useful in chronic aortitis and aortic aneurysm. The salts of potassium and sodium are most frequently prescribed, the former if a syphilitic element is present,

the latter being preferable under other circumstances since it is more easily assimilated and is less likely to disturb the stomach. The administration of the iodides may be continued for considerable periods with intermissions during which tonics, such as iron, arsenic, or quinine, should be prescribed.

Sterility and the X-rays.—BERGONIÉ and TRIBONDEAU (*La revue medico-sociale*, 1907, i, 31) have proved that the *x*-rays exercise an intense destructive action upon the spermatic cord. A single exposure may be sufficient to sterilize the seminal canals in the animal, although the general condition remains unaffected and the sexual ardor continues unimpaired, even when the semen is deprived of spermatozoa. Other observers have confirmed these results and consider that sterility is very easily caused in man by *x*-ray exposure, owing to the situation of the testes and the slight protection afforded by the scrotum to these organs. In the female, the ovaries being deeply situated, sterility is less easily brought about. Those who work with the Röntgen rays should take the very necessary precaution of wearing shields of lead or of rubber covered with bismuth.

Opsonins and Their Relations to the Treatment of Bacterial Infection.—OPIE (*Yale Med. Jour.*, 1907, xiii, 301) asserts that the early work of Wright and Douglas has shown that normal blood serum exerts an influence upon phagocytosis of certain bacteria. The power of the serum to promote phagocytosis may be increased by immunization. Injection of a bacterial vaccine results in a phase of decreased opsonic power followed by a phase of heightened activity. It is not yet possible to decide with how great success Wright has applied these facts to the treatment of infections. The determination of the so-called opsonic index is subject to grave error, but at present offers the best means of estimating the power of the blood serum to promote phagocytosis. In spite of errors determination of the opsonic index indicates the occurrence of a negative phase of opsonic power following inoculation and offers the only possibility of avoiding the harmful effect of decreasing by such inoculation, rather than increasing, resistance to bacterial invasion. The opsonic index with the affections which have been examined, and notably with tuberculosis, is subject to such wide variation that it promises at present little diagnostic aid. The almost uniform success claimed by Wright and his co-workers in treating suppurative infections and localized tuberculosis is sufficient warrant for the widespread interest which the subject is attracting.

Contra-indications to the Use of Opium in Acute Disease.—BOUSFIELD (*Pract.*, 1907, lxxviii, 663) states that there are certain contra-indications to the administration of opium in acute diseases; some precluding its use altogether while others suggest that only small doses may be given with safety. If the lungs are embarrassed with a considerable amount of fluid arising from any cause, as met in the œdematous bases often observed in acute disease in old people or in those suffering from heart weakness, opium should be avoided, any ease resulting from its use being too dearly purchased. The susceptibility of young children to the drug as a rule precludes its use in their acute diseases, except in

such conditions as cholera infantum, in which its specific action on the intestines may be valuable. In older children opium should be given in moderate doses only, and its effect should be carefully watched; the same is true in respect to aged patients. With regard to high arterial tension and other signs of chronic nephritis, the fact that opium is excreted almost wholly by the bowel and scarcely at all by the kidneys, and that it may be given in uremia with safety, might show that this condition might not contra-indicate the use of opium; this may be the case when the disease is strictly localized, as in some limited acute inflammation or spasmodic contraction of a muscular tube, but when the acute disease is of general or infective character there is certainly, as in instances of chronic renal disease, a special danger that respiratory complications, such as diffuse bronchitis or pulmonary œdema may supervene; consequently opium should be used with great caution, if at all. Digestive disturbance, headache, and marked constipation are in lesser degree, contra-indications. In any acute abdominal disease, if the question of operation is to be raised, care must be taken to give opium in such moderate doses that, while immediate pain is relieved, the clinical picture is not obscured.

Basic Quinine Acetyl-salicylate.—SANTI (*Les nouveaux remèdes*, 1907, xxiii, No. 5) has been able to prepare this salt, which he expects will advantageously replace quinine salicylate, as follows: He mixes equimolecular amounts of acetyl-salicylic acid and quinine hydrate and dissolves them in ether, following which an oily precipitate forms, which soon becomes a crystalline mass; this is basic quinine acetyl-salicylate, a bitter, white salt, slightly soluble in water, more soluble in alcohol and chloroform and almost insoluble in ether. Experimentation seems to show that this salt is of value in pleurisy and peritonitis and that it is a more effective antipyretic than the ordinary quinine salts. The ordinary dose is 6 grains.

Quinine Phytinate.—According to POSTERNACK (*Jour. de méd. de Paris*, 1907, XIX, 88) this substance is an anhydro-oxymethylene-diphosphoric acid of quinine containing 57 per cent. of quinine and 43 per cent. of phytinic acid; consequently, it allows the administration of these two agents each in sufficient dose. Quinine phytinate is indicated in all conditions in which the ordinary salts may be employed. Phytinic acid is a valuable and certain general tonic to nutrition and is an aid to the organism in combating microbic infection, consequently it is a useful adjunct to quinine in its action upon the malarial organism and in puerperal and enteric fevers. Quinine phytinate is especially indicated in malarial cachexia and it has been employed with good results in the neuralgias and vertigo of Ménière's disease; and in certain forms of diabetes it is considered to affect favorably the destruction of sugar in the organism.

Thyroid Extract in Hay Fever.—POTTIER (*Jour. de méd. de Paris*, 1907, xix, 130) has employed thyroid extract in three instances of hay fever. In one of these a complete cure was established, in another the result was unsatisfactory on account of co-existent affections, such as hemorrhage into the vitreous body due to arteriosclerosis; in a

third the patient suffered from more of the symptoms of his disease through a long and particularly hot summer even though he was exposed to the usual influences which had been accustomed to give him trouble. The dosage prescribed was 1½ grains of the extract given twice daily, with periods of intermission. While Pottier states that the treatment has been employed in too few patients to draw definite conclusions, he considers that this form of treatment merits further trial.

The Treatment of Angina Pectoris.—Weissbart (*Zentralbl. f. die gesammte Thérapie*, 1907, xxv, 173) reports upon a preparation known as dyspnon which is dispensed in tablets containing each 3¾ grains of theobromine sodiosalicylate, 1½ grains of theobromine sodio-acetate and 1½ grains of extract of quebracho, as being of value in angina pectoris and allied conditions. He has used dyspnon in five patients. The first was an instance of syphilitic aortic insufficiency with coronary angina in which the anginoid attacks remained absent as long as the medication was continued. Good results also followed its use in an instance of stenocardia due to aortic and mitral insufficiency and in a patient suffering from arterioscerosis with apoplectic seizures. Weissbart recommends the employment of this preparation in the cardiac asthma of endocarditis and arteriosclerosis. The usual dosage is two tablets three times daily

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The Various Carbohydrates in Diabetes.—Labbe (*Revue de thérap.*, 1907, lxxiv, 229) considers that the proper selection of carbohydrate foods for the diabetic is quite as important as any other point in the diet regulation of this disease. All carbohydrate foods do not by any means act the same upon these patients. In accordance with the tolerance of the diabetic for carbohydrates Labbé arranges this class of food in the following order: Potatoes, oatmeal, macaroni, chestnuts, rice, dry beans, lentils, dry peas, milk, bread, sugar. Diabetics are able, without exhibiting glycosuria, to eat a larger quantity of potatoes than of bread, and the former article of food is the carbohydrate of choice for patients suffering from this disease. Cereals, rice, and dry legumes are almost equally good, but bread should be forbidden. The difference in the toleration of diabetics for the various foods of this class is due to the difference in their chemical constitution and to the intra-organic evolution of the different starches and sugars.

Thyroid Extract in Cretinism.—Fischer (*Monthly Cyclopedia of Pract. Med.*, 1907, v, 210) cautions against the toxic effect of an overdose of this substance, which has such a remarkable effect in cretinism. The physiological effect of the extract should be studied exactly as we should study the effect of drugs in any instance in which circulatory disturbance exists. The stimulant action of the thyroid extract upon the vascular system often causes flushing of the face, marked restlessness, and rapid pulse rate. We should always be on the watch for peculiar susceptibility and idiosyncrasy regarding thyroid treatment. Five grains of the desiccated gland may be given daily, which is the

equivalent of one-sixteenth of an average sheep's thyroid gland. Some patients will respond to half this dose, while others may require a larger quantity. The first evidence of overdosage is a gastro-enteric disturbance, with vomiting, diarrhœa, and fœtid breath. There may be abdominal pain and tenderness and very rapid loss of weight. Blood examination will show marked destruction of the red corpuscles.

Electric and X-ray Treatment of Neuralgia.—De Courmelles (*Bul. gén. de thérap.*, 1907, x, 367) considers that faradism is inferior to galvanism in the treatment of neuralgia. For facial neuralgia the positive pole is applied to the painful area for from five minutes to an hour, while in sciatica the negative pole is placed over the seat of the pain. The author finds also that the ultra-violet ray acts as a sedative, while the blue light is less active in this regard. The *x*-rays and radium are also very useful, but must he employed with skill and care. Their action is rapid, the pain being lessened in a few minutes and, if the treatment is continued for several (twelve) sittings, may be wholly relieved. The treatment should not be given oftener than once daily if the patient exhibits the least febrile reaction.

Renal Decapsulation in Nephritis.—Ertzbischoff (*Thèse de Paris*, 1906; *Revue de thérap.*, 1907, lxxiv, 176) has studied the effect of this operation in 15 patients whom he has been able to follow. In a few of these death succeeded the operation; the fatal outcome was the result of uremic poisoning. In 6 patients the result was *nil*, the albuminuria persisting as before. In 2 patients only was there real improvement; here with the aid of a diet lacking in chlorides the albuminuria diminished or disappeared. On reviewal of these and other previously published instances of renal decapsulation we can but realize that the procedure has hardly given the good results hoped. However, it would seem that it is of benefit in the so-called infectious nephritis and that the contrary is true of nephritides of intestinal origin; here the operation may be undertaken, not with the hope of cure, but with the expectation of lessening the hematuria and the pain. An anatomic study of the kidneys of the deceased patients shows that a new and thicker capsule is formed and that a secondary sclerosis takes place which may remain superficial or extend into the substance of the organ.

Santonin.—Séjournet (*La quinzaine thérap.*, 1907, viii, 31) has studied the interesting question of the treatment of diabetes by means of santonin, and states that under its influence the glycosuria becomes rapidly diminished, the polyuria becomes lessened, the patient's strength is increased, and the thirst and the dryness of the mouth are ameliorated. Santonin also possesses a stimulant effect upon the nervous system as well as an antispasmodic action, and, in view of the important role played by this system in the genesis of diabetes, ought to diminish the glycogenic function of the liver. Santonin should be prescribed, just as are valerian, camphor and its bromide, and the various cyanides, in conditions in which we wish to lessen or prevent excessive muscular contraction and when we desire to restore to the nervous system its normal,

regulator action. Bircage considers that this drug possesses an analgesic effect in the lightning pains of tabes and that its feeble toxicity permits its continued administration.

The Internal Treatment of Acne.—KAPP (*Thérap. Monatsh.*, 1907, xxi, 138) has found what he considers a distinct relationship between indican and other products of the putrefaction of proteid in the intestinal tract, in the urine, and acne. This connection naturally suggests combating the intestinal condition as a means for the relief of the folliculitis. Kapp prescribes as an intestinal antifermentive a combination of 15 grains of precipitated sulphur and 4 grains of menthol; this is taken two or three times daily. A series of 33 patients affected with the various types of acne, simplex pustulosa, and indurata, have received this treatment for from three to four months with excellent results. The only unpleasant effect of the treatment was one instance of temporary diarrhœa and coliky adbominal pain; under its employment the products of intestinal putrefaction in the urine became much diminished and the acne was markedly benefited. With the internal medication the usual local treatment was prescribed.

PEDIATRICS.

UNDER THE CHARGE OF

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Impaired Resonance Behind and Beneath the Inner Third of the Clavicle in Normal Children.—The areas of impaired resonance S. McC. HAMILL (*Archives of Pediatrics*, 1907, xxiv, 92–94) found in the chests of the majority of infants and children in perfect health. He elicited it with greater difficulty in infants than in older children; he found it less common in later childhood than in the early and middle periods. In the majority of the children it did not extend beyond the inner third of the clavicle; it is elicited by percussing the clavicle and the first interspace immediately beneath. Sometimes it extends as far as the midclavicular line; it then extends downward, blending into the upper border of cardiac dulness. It is more easily noted with the child lying down than in the upright posture. He explains it by asuming that the posterior position of the lung in early life brings the great vessels into more intimate contact with the anterior chest wall.

A Case of Knotting of the Hair.—J. M. H. MACLEOD (*Brit. Jour. Dermat.*, 1907, xix, 40) reports the case of a girl of thirteen, afflicted with trichonodosis. Her hair would not grow properly, breaking off whenever it reached her shoulders. At the age of six, during a pneumonia, to facilitate the ice applications her hair was cut; as it grew badly during covalescence her scalp was shaved to stimulate the growth

of hair; but in spite of all treatment it never recovered. The ends of the hairs were either split into several fibers, pointed and atrophic, or bent up like a hook. There was no pityriasis, no hyperkeratosis at the mouth of the hair follicles, or any other pathological change. The hairs were dry, lustreless, but pigmented; the majority formed loops at the end. Some were twisted on their long axis and formed single or double loops or knots toward their periphery; some of the knots were drawn tight, others loose. No organisms or fungi could be discovered on careful examination. The mode of development of this curious malformation could not be discovered.

The Etiology of Convulsions in Infancy and Childhood.—JAMES MCILRAITH (*Medical Chronicle*, 1906, November and December; 1907, January) has studied 250 cases in which convulsions occurred. The two chief predisposing causes are an hereditary history of neuropathic taint (143) and rickets (94); both causes co-existed in 25 of the cases. The exciting causes were as follows: abnormalities of labor 10, cerebral paralysis 8, infantile paralysis 2, congenital syphilis 6, hydrocephalus 2, meningitis 1, trauma 9, insolation 1, dentition 3, gastro-intestinal disorders 108, overloading stomach or improper food 7, reflex irritations from various sources 20, onset of measles 7, onset of pneumonia 13, onset of rheumatic fever 1, whooping-cough 7, during measles or pneumonia 4, following an acute fever 9, jaundice 3, mental deficiency 5, idiopathic 24. His conclusions from the study of the cases are: Convulsions are most frequent during the first year of life, and not very frequent after the third year. The predisposing causes are more important than the exciting causes. The predisposing causes are an inherited neurotic taint and rickets. Healthy children born from healthy parents rarely suffer from convulsions. In children suffering from convulsions there is frequently a history of ill-health or disease in the parents, especially in the mother during pregnancy, and this acts by lowering the vitality of the child and rendering it more liable to disease. The family history of children suffering from convulsions is bad. Frequently the brothers and sisters suffer, and the mortality in these families is high. Only a small proportion of cases can be ascribed to organic disease of the brain or to injuries at birth. The most common cause of convulsions in the first two months of life is reflex irritation from the alimentary tract. The great majority of cases are due to reflex causes. Dentition is rarely a cause of convulsions, and only when some predisposing cause exists. Gastro-intestinal disorders are the chief exciting causes of convulsions. Convulsions are by no means as frequent as generally supposed at the onset of acute fevers, such as measles and pneumonia. They are more common at the onset of pneumonia than at the onset of measles. When they do occur there is usually some predisposing cause present. In several of the cases of convulsions associated with whooping-cough a predisposing cause was present. Convulsions are by no means frequent in whooping-cough, when no predisposing cause exists and no complications occur. Convulsions in early life may be the first sign of epilepsy, or may give rise to that condition in later life, and this is more likely to occur when there is no obvious cause for the attack. The fundamental cause for convulsions is some predisposing cause.

Bronchitis in Children.—The treatment of this condition is outlined thus by JOHN U. FAUSTER (*Medical Council*, 1907, April, 132–135): The hygienic part consists in keeping the temperature of the room uniform, between 68° and 72°, during the twenty-four hours; sunlight is considered desirable. The child should be kept in a bed, so it can be moved about from time to time; if the room is draughty a screen should be kept around the bed. Unnecessary noise and visitors should be excluded. An extra-long flannel night-gown should be worn, so that the patient may wriggle about. The food should be given frequently and in small amounts; it should be of the blandest character. Water should be given frequently by the mouth, but Fauster does not approve of sponging, as it contracts the superficial capillaries and still more engorges the already impeded circulation. He advises a mustard plaster to the chest, this to be kept applied until full dilatation of superficial capillaries is produced; the chest should then be covered with a cotton jacket; this procedure must be repeated every twenty-four hours. The author disapproves of the various types of poultices, clay applications, and inhalations. Medicines should be of pleasant taste, as otherwise the worry and excitement attendant upon their forcible administration produce positive injury. The bowels should be well opened; the best drug for the purpose is in calomel, $\frac{1}{10}$ grain every hour until the bowels are thoroughly evacuated. Of other drugs he considers ipecac indicated when there is troublesome cough with whistling rales; belladonna, when the secretion is very abundant and a respiratory stimulant be needed; aconite, if there is fever and the heart overactive; bryonia, when there is a dry, painful cough and danger of extension to the lung parenchyma exists. The drugs should be given in small doses frequently repeated; they may be given singly or in combination.

Maniacal Chorea.—J. MAGEE FINNY (*Brit. Med. Jour.*, 1907, i, 976) reports a case of this condition in a girl of seventeen. She had been complaining of rheumatic pains in the legs for several weeks; they disappeared and chorea supervened. A mitral systolic murmur was audible from the beginning, of varying loudness and lasting up to the ninth day—the day of her death; the pulse was quiet and regular each day (about 80) until the last three days, when it rose to 140; the temperature was normal until the day before death, when it reached 104°. The choreic movements were slight for the first two days, and then they became so violent that two nurses were required to watch her, to prevent her from falling out of bed and injuring herself. The psychic phenomena were out of all proportion to the motor, and at first overshadowed the motor; they differed from the acute delirium of fever and acute mania by the absence of incoherent speech and wild garrulity. There were occasional periods of mental calm, during which she ceased shouting and her movements became quieter; but these lasted but a short time. Medicines were of no service beyond giving an occasional period of sleep; chloral and chloroform inhalations were the most valuable for this purpose. The autopsy revealed no abnormality beyond hyperemia of the brain and a few thromboses of small vessels of the cortex. There was no mitral valve disease and the murmur must have been due to ventricular dilatation. No micro-

organism was found either in the cultures made from the spinal fluid or in any of the sections of the meninges.

Multiple Neuritis (Non-diphtheritic) in Children.—H. M. THOMAS and H. S. GREENBAUM (*Jour. Amer. Med. Assoc.*, 1907, xlviii, 1397) have been able to collect and tabulate from the literature 138 cases of non-diphtheritic multiple neuritis in children. Measles was claimed to have been the cause in 8, whooping-cough in 7, scarlet fever in 6, and 27 were due to other infectious conditions; of 48 toxic cases 19 followed lead and 19 arsenic chorea; in 33 the cause could not be determined. The condition is usually considered as very rare, but the authors believe it to be less uncommon than usually thought. They have seen 10 cases; 7 were in girls and 3 in boys; the ages varied from 3 to 12. In 3 the cause was found to have been typhoid fever, in 2 lead, in 1 arsenic and chorea (fatal), and in 4 the cause could not be determined. The cases are reported in detail. It is seen that the symptomatology does not differ materially from that of the disease in the adult. Sensory disturbances are said to be difficult to determine, and when present do not persist very long; reactions of degeneration with atrophy are generally noted; the deep reflexes are lost during the height of the attack, but return during recovery. The paralysis is usually widespread and symmetrical, affecting both upper and lower limbs; the legs are generally more severely involved than the arms. The differential diagnosis from poliomyelitis is not always easy: multiple neuritis comes on more insidiously, its cause is often apparent, it rarely is associated with fever at the outset, objective disturbances are more common in neuritis, the paralysis is more widespread and symmetrical, and recovery is more common. The prognosis in multiple neuritis of children is usually good, but few deaths having been recorded.

OBSTETRICS.

UNDER THE CHARGE OF

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Two Cases of Repeated Ectopic Gestation.—KYNOCH (*Jour. Obstet. and Gyn. Brit. Empire*, December, 1906) has collected 585 cases of ectopic gestation, among which there were 34 cases of repeated extra-uterine pregnancy. No authentic case of ectopic pregnancy occurring three times in the same patient has yet been reported. The most frequent form of reptition is in the opposite tube.

Kynoch's first case was that of a woman married fourteen years, and having six children without miscarriages. Menstruation had been regular except during pregnancy. The last normal menstruation was ten weeks before admission to the hospital, and for a month before coming under observation the patient had complained of intermittent

pain in the left iliac region, with irregular hemorrhage. The pain came on suddenly and was severe, and made worse by defecation.

On examination the uterus was somewhat fixed and displaced by a swelling in the left side of the pelvis. Under anesthesia this was made out to be about the size of an orange, and in the left broad ligament. It was considered a hematoma as the result of a ruptured tubal pregnancy, and operation was deferred to await absorption. After ten weeks in the hospital the patient left in good health.

She was again admitted to the hospital about eighteen months afterward complaining of pain in the right iliac region. A tender swelling was found at the right side of the uterus, and upon operation the right tube was found adherent, and removed. The left uterine appendages were also adherent, and there was thickness in the upper part of the broad ligament.

On examining the specimen removed decidual cells were found, establishing a diagnosis of ectopic gestation. The case proved to be a six weeks' ectopic gestation in the left Fallopian tube, rupturing into the broad ligament and becoming absorbed in two months, followed eighteen months afterward by pregnancy in the right Fallopian tube.

The second case had at first an ectopic gestation upon the right side, treated by operation. The right tube was distended with blood clot, and was removed. The left tube and ovary were normal. The patient made a good recovery from operation and was subsequently delivered by forceps of a healthy male child.

Her second ectopic pregnancy developed about eighteen months afterward in the left tube, and upon operation a clot the size of an orange was found surrounding the fimbriated extremity. This was removed and the patient made a good recovery.

The Pathology of Cornual Gestation.—LOCKYER (*Jour. Obstet. and Gyn. Brit. Empire*, December, 1906) describes a specimen obtained by Doran of cornual gestation ending in rupture. Microscopically the ruptured cornu was of nearly square shape, with a laceration extending the whole width of the upper border. The wall of the gestation sac varied greatly in thickness, the fœtus lying in a closed amniotic sac, covered in places by adherent blood clot. The placenta in its formation was very diffuse. The fœtal side of the placenta was smooth, represented by chorion from which the amniotic sac had been stripped during the expulsion of the fœtus. The pedicle of the gestation sac was solid, containing large vessels with thickened walls.

Nothing resembling a uterine mucosa or basal decidua was found in the specimen. The villi of the chorion were planted directly on the uterine muscle by masses of Langhans' cells. Where this came in contact with the muscle there was an inflammatory area mixed with cells of fœtal origin, forming an infiltrating zone. Just beneath this the muscle was in cloudy swelling. The appearances were those of ordinary inflammation.

The walls of the pregnant cornu were thicker than the walls of a pregnant Fallopian tube. The eroding action of the ectodermal tissue could be very plainly studied. The placenta was attached to the whole surface of the sac wall, and rupture occurred through the upper pole where the rudimentary horn is thinnest. In such tissue there is no

retraction and relaxation, and hence the point of rupture. No vestige of normal glandular mucous membrane was found, and no decidua. The villi were dissecting the muscle layers, opening vessels and lymphatics. This resembled a malignant process with total absence of decidua. By repeated sections through a uterine gestation, it has been observed that the vesical of the embryo and its chorionic offshoots do not approach the muscular tissue of the uterus. In the gravid cornu the villi attach themselves directly to the muscular tissue by clusters of the ectodermal cells; while in the normal uterus the ovum is embedded in mucous membrane, in the rudimentary horn, the ovum seeks nutrition directly from the muscle. If the horn of the uterus be well developed the pregnancy will go to full term; if feebly developed, the muscular wall will rupture. The weakest point in the muscle wall against invasion by fœtal ectoderm is found by microscopic study to be the vessels. This is illustrated by microscopic drawings. The muscle fibers fail to form a compact decidua, the characteristic decidua being never evolved from muscle cells. After the rupture of the cornual sac the thinned-out muscular tissue is thrown into convolutions, the clefts of which are filled with fibrinous material from lymph and blood clot. The muscular convolutions form before rupture and are caused to rupture by the contraction of the muscular tissue. Over the weakest point in the gestation sac was found a covering of lymph with extravasated blood. This had probably exuded before the escape of the ovum. The latter occurred during the examination of the patient in the clinic by bimanual palpation. This has repeatedly happened in the experience of other observers.

Ectopic Gestation at Full Term, with Abdominal Section.—TATE (*Jour. Obstet. and Gyn. Brit. Empire*, December, 1906) reports the case of a patient admitted to St. Thomas' Hospital in her first pregnancy. Some time previously, when about three months pregnant, the patient had an attack of severe pain in the lower abdomen, continuing for several days, and in a lesser degree for about a month. This pain returned, and the patient was in bed about two months. During the early part of the day, while in pain, blood clots were passed from the vagina. Since leaving her bed the patient felt weak, with abdominal pain, and the abdomen increased in size. Fœtal movements were recognized for about six weeks, and then ceased.

False labor developed, which subsided, recurring a month later. As normal labor did not develop, the patient went to the hospital, where a diagnosis of ectopic gestation was made.

On examination, the fœtus could be plainly felt, made out in an abdominal tumor, extending about two inches above the umbilicus. The uterus could be recognized as not in the tumor, and the fœtal heart could not be heard. On abdominal section the dead fœtus was found free in the peritoneal cavity. The omentum and intestines were stained with meconium; the cord extended to a large elastic swelling in the lower abdomen, formed by the placenta, Fallopian tube, and broad ligament. This mass was removed entire by a series of ligatures, and vessels, in addition, were tied. There was considerable hemorrhage during enucleation of this mass. The patient was given intravenous saline transfusions and at once improved. She ultimately made a

good recovery. On examining the fœtus, it was found at full term without offensive odor, and the umbilical cord was attached to the placenta at the edge.

Intraligamentary Pregnancy Going to Full Tetm.—LYLE (*Jour. Obstet. and Gyn. Brit. Empire*, December, 1906) reports the case of a patint who had suffered from free hemorrhage, continuing for several months. Amenorrhœa developed, and the patient found herself pregnant. A tumor developed at the right side of the abdomen, and one also upon the left. Although the patient usually had vomiting during pregnancy, it was absent in this instance. Upon examination, a tumor was found upon each side of the uterus at the brim of the pelvis. A uterine souffle was heard below and upon the left of the umbilicus; there were no heart sounds. Upon operation a tumor was found in each broad ligament which contained an ectopic gestation. The gestation sacs were both removed.

Lyle also reports a second case of intraligamentary pregnancy in which abdominal symptoms of pregnancy developed, with fœtal movements, which ceased after the patient had a serious cardiac attack. The patient's symptoms gradually subsided. The abdomen was enlarged and about the size of a seven months' pregnancy. There was no pain or tenderness, and no fœtal heart sounds were heard. Upon operation the tumor resembled a pregnant uterus. The wall of the sac was muscular, the sac containing a macerated fœtus. It was impossible to remove the sac, as the effort to do so produced free hemorrhage. The sac was thoroughly washed out with normal salt solution, the wound carefully sutured, and the abdomen closed. After the operation the patient had fever, and on the eighteenth day the sac was opened through the vagina, followed by the discharge of pus and gas. Under douches, the temperature fell to normal, and the patient made a good recovery.

Death from Hemorrhage and Septic absorption after Section for Full-term Ectopic Pregnancy.—FAIRBAIRN (*Jour. Obstet. and Gyn. Brit. Empire*, December, 1906) operated upon a patient having a tender abdominal tumor, which was thought to be a dead child possibly retained in the uterus. Under anesthesia the uterus was explored and found to be empty and lined with decidual membrane. Upon opening the abdomen, a dark, cystic tumor was found which seemed to be behind the peritoneum. The intestines had been lifted up, and lay behind the sac. After packing around the sac, it was opened and contained a dark fluid with an inoffensive odor. The placenta was attached to the lower wall of the sac, and the attempt to detach a small portion of the edge caused serious bleeding. This became dangerous, and was controlled by packing. The sac wall was sutured to the abdominal incision.

The patient continued to bleed at intervals, and gradually symptoms of septic infection developed. On again exploring the cavity a piece of very offensive placenta was removed, followed by free hemorrhage. This seemed to cause the death of the patient. At autopsy peritonitis was absent and the sac was in front of the peritoneal cavity with a very extensive base, the pregnancy having originally developed from the

right broad ligament. A large placenta in a partially broken down condition was found.

This case illustrates how difficult it is to trace the entire sac of an abdominal pregnancy, and how persistent is the circulation in these cases when active hemorrhage occurs six weeks after the death of the fœtus. Cultures taken from the sac were practically sterile.

Full-term Pregnancy in a Bicornate Uterus, with its Removal.—ROBERTS (*Jour. Obstet. and Gyn. Brit. Empire*, December, 1906) reports a remarkably interesting case in which a fœtus went to term in a rudimentary horn of a bicornate uterus. The fœtal sac did not rupture; the fœtus died and was retained in the abdomen for six months. During this pregnancy the patient was almost as well as usual, complaining of very little except the inconvenience caused by the tumor. Upon operation the tumor was covered by adherent omentum. It had a grayish-brown appearance, often seen in ovarian cysts which are degenerated. In trying to lift up the tumor the adhesions had to be separated. Its attachments or base were the left tube and ovary, where good-sized vessels had to be divided before the tumor could be removed. The right tube and ovary were normal. The pedicle of the tumor was the remains of the left tube and a portion of the broad ligament. The patient made a good recovery.

A similar case is reported by Mauriceau. In describing it Mauriceau distinguished plainly between tubal and cornual pregnancy, basing his distinction on the relations between the round ligament and the gestation sac. The condition was discovered at an autopsy in the seventeenth century, in a woman who died suddenly after abdominal pain, which was intense for three days.

OPHTHALMOLOGY.

UNDER THE CHARGE OF

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PROFESSOR OF DISEASES OF THE EYE IN THE PHILADELPHIA POLYCLINIC.

Heredity in Myopia.—WORTH (*Brit. Med. Jour.*, February, 1906) analyzes 687 cases of myopia, of which 33 were malignant, with reference to heredity. This factor was present in 56 per cent. of the non-malignant, and in only 24 per cent. of the malignant cases. In one family all the males were myopic, the females not, but it was through the latter that the myopia was transmitted. All the non-myopes had blue irides, the myopes brown. Of the 374 hereditary cases the parents were affected in 159; in the remainder it was the uncles, aunts, and grandparents who were myopic.

Iridectomy Combined With Sclerectomy in the Treatment of Chronic Glaucoma.—LAGRANGE (*Archiv. d'ophtalmol.*, August, 1906) has advised a new procedure for the establishment of a filtration cicatrix. An incision is begun with puncture and counter puncture in the sclera as near the angle of filtration as possible. Just as the section is about to be completed the edge of the knife is turned a little backward, the result of which movement is to produce a bevelled opening in the sclera like the vents of a flute; when the knife has cut through the sclera and has come to lie beneath the conjunctiva, it is turned directly backward so as to detach a large conjunctival flap. A small bit of that portion of the scleral flap toward the cornea is excised; to accomplish this the conjunctiva is raised by a narrow clawed forceps curved on the flat. The anterior lip of the wound thus becomes prominent and a narrow flap can be readily cut from the sclera by very sharp fine scissors sharply curved. A wide iridectomy as usual completes the operation. After healing is complete, a narrow white line beneath the conjunctiva marks the site where the sclera has been exsected. Lagrange claims that this sclerectomy provides an adequate exit of filtration. He has practiced this method upon twenty cases, without serious difficulty or the least immediate or consecutive accident. The results are stated to have been quite satisfactory. Fifteen cases are fully reported and commented upon, of which the oldest goes back three years and none less than six months.

He adds that while an eye affected with angiosclerosis will necessarily continue to undergo the process of sclerosis, and that if the nerve is undergoing atrophy under the influence of a diathesis, such atrophy will necessarily continue, he is entirely convinced that the filtration scar obtained by this procedure possesses all the advantages of a cystoid cicatrix without the disadvantages of prolapse of the iris. Hypertension is abolished, than which nothing more fortunate can occur in the case of an eye affected with glaucoma.

Arterial Tension in Cataract.—FRAENKEL and GARIPUY (*Archiv. d'ophtalmol.*, October, 1906, p. 615), based upon personal researches, have come to the following conclusions as regards the arterial tension in senile cataract: (1) Senile cataract is accompanied but rarely by arterial hypertension. Of 99 cases it was found in only 9. (2) Hypertension is regularly found in those affections which it usually accompanies without reference to the presence of cataract (nephritis, diabetes). (3) The age has no influence upon the arterial tension. (4) If it is true that arteriosclerosis is always accompanied by a certain degree of arterial hypertension, it may be affirmed that arteriosclerosis does not usually accompany cataract and that the former is not a factor in the causation of senile cataract. (5) The decrease in renal permeability which is found in those affected with cataract has no appreciable influence upon the general circulation. (6) It may be addmitted that diminution of renal permeability, too slight to give any appreciable clinical symptoms, suffices for the retention of crystalline cytotoxins within the organism. (7) Arterial hypertension in senile cataract contributes to the production of postoperative intra-ocular hemorrhages, either into the anterior segment of the eyeball or from the choroid (expulsive hemorrhages). (8) It is therefore possible to recognize before the operation that small number of patients who, by reason of arterial

hypertension, are exposed to such hemorrhages, and so to permit of efforts being made to forestall such complications in diminishing the tension by proper therapeutic means (mode of life, purgatives, iodides, etc.).

So-called Rheumatic Diseases of the Eye.—ANTONELLI (*Archiv f. Augenheil.*, August, 1906, p. 404) maintains that the term "rheumatic" should be abandoned in ophthalmology. Embraced under this term various disease processes have been included which have nothing in common. Ocular diseases (uveitis and retinochoroiditis) following acute arthritis or polyarthritis are of infectious or infectiotoxic origin. Those occurring in pseudorheumatism belong to syphilis, tuberculosis, or gonococcic infection. Of those arising after catching cold, iritis rheumatica, scleritis, keratitis, episcleritis, and tenonitis in subjects affected with chronic rheumatism, it is not yet proved that all are due to the diathesis in question.

The ocular diseases ascribed to "arthritism" are in part due to auto-intoxication, as, for example, many forms of chronic blepharitis or blepharoconjunctivitis, and in part to gout, as for example many varieties of retinochoroiditis.

HYGIENE AND PUBLIC HEALTH.

UNDER THE CHARGE OF

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Wood Alcohol Poisoning from Varnish—An unusual case of poisoning by wood alcohol is reported by H. GIFFORD (*Ophthalmic Record*, June, 1906). After working about four hours in a room of 1800 cubic-feet capacity, tightly closed so as to keep out dust, applying to the woodwork first a stain and then a varnish, both made with wood alcohol, a man became absolutely blind, but had no other symptoms of poisoning. After a week, vision began to return, but after a few weeks it began to fail again, and in six months he was quite unable to see. Very slow improvement began again, and in about a year he was able to find his way about the streets.

Toxin of Bacillus Enteritidis of Gaertner.—E. P. CATHCART (*Jour. of Hygiene*, April, 1906, p. 112) reminds us that food infected with Bacillus botulinus or Bacillus enteritidis is much more likely to be dangerous on account of absence of obvious signs of putridity than that which is really putrid and has bad odor, color, and flavor. With Bacillus botulinus there is but faint odor; with Bacillus enteritidis no odor at all. The most dangerous of all is the latter, since cooking does not destroy its toxicity. Experiments concerning the toxins of various food poisoning organisms led Cathcart to the following (among other) conclusions: Cultures of Gaertner's bacillus grown in broth do not excrete any large

amount of toxin into the fluid medium. Suspensions in broth made from ordinary agar cultures and killed by heat (60° C. thirty minutes) are fairly toxic. Gaertner toxin withstands heating to 100° C. for thirty minutes. Paratyphoid β bacillus cultures on antolysis yield a filtrate quite as toxic as those from Gaertner's bacillus. Paratyphoid toxin resists 100° for thirty minutes. Colon toxin is not heat resistant.

Boron Preservatives and Increased Mortality in England and Wales from Diseases of the Kidneys.—In reply to the dogmatic statement of H. W. Wiley, of the Bureau of Chemistry, that the large increase (asserted to be 30 per cent.) in kidney diseases in England is due without doubt to the use of coloring matters and preservatives in foods, and to the statement of Richard Jones that the gradual increase in the death rate from acute nephritis during the past twenty years is due to the excretion of food preservatives, especially the boron compounds, by the kidneys, B. FARADAY GILES (*Lancet*, 1906, ii, 1347) shows by a tabulation of the figures of the reports of the Registrar-general that before boron preservatives were in general use, the rate of increase in mortality from what were returned as nephritis and Bright's disease was even greater than afterward. Thus, during the decade 1861–1870 the annual rate per million (England and Wales) was 112; during 1871–1880 it was 199. Again, the annual mortality per million due to diseases of the urinary system, during the quinquennial periods 1861–65, 1866–70, 1871–75, 1876–80, ran thus: 246.4, 287, 326, 375. Hence before the use of boron preservatives had become important the mortality due to all diseases of the urinary system had already increased 52 per cent. in twenty years.

Poisoning by Saccharin.—LUTH, of Bajohren (*Lancet*, April 7, 1906), a town on the Russian frontier, describes the case of a woman who, after a dispute with her husband, had swallowed about 2 grams of saccharin. When a medical man arrived, about fifteen minutes later, he found her lying on the floor, and her condition was at first supposed to be due to alcoholic intoxication. She was unconscious, her face was flushed, she foamed at the mouth, and suffered from convulsive attacks with choking; her respiration was frequent and her pulse was weak, very quick, intermittent, and irregular. Under artificial respiration and massage of the heart, the pulse within half an hour became stronger and regular, and the respiration became normal. After about forty-five minutes the patient awoke and was quite well. Poisoning by saccharin is rather rare. It is remarkable that severe symptoms occurred within only a few minutes and as rapidly disappeared. In Germany saccharin is sold to the public only on medical prescription, and the woman had therefore purchased the drug from a neighboring Russian pharmacy.

Detection of Sterilized Milk.—Raw milk has the property of reducing certain substances such as indigo, litmus, and methylene blue, which are converted into colorless compounds, but whether this property is due to bacteria or to a natural reducing ferment is the subject of controversy. Schardinger found that methylene blue is decolorized more rapidly if a slight amount of formalin is added to the reagent, and on

this fact H. SMIDT (*Arch. f. Hyg.*, 1906, lviii, p. 313) bases his method of distinguishing raw from cooked milk, using as reagents an aqueous solution containing 2.5 per cent. each of formalin and saturated alcoholic solution of methylene blue, and another containing the same amount of methylene blue, but no formalin. Added in the proportion of 1 to 20 parts of milk, the first-named reagent alone is decolorized by fresh, raw milk, but both are decolorized by stale milk, while neither is affected by boiled milk in ten minutes, at a temperature of 104° to 122° F. From his experiments he concludes that if a simple solution of methylene blue is decolorized by raw milk, the action is attributable to bacteria present in the milk; that the speedy reduction of the methylene blue-formalin mixture by fresh, raw milk can be explained only by the presence of a ferment that acts catalytically on formalin; that the action of an added alkali on the milk sugar produces a reducing substance, and that prolonged boiling causes the production of substances which can decolorize methylene blue, but only at the boiling point. He believes that milk contains no preformed reductase.

The experiments of E. SELIGMANN (*Zeit. f. Hyg. und Infectionskrankheiten*, 1907, lii, 161) lead him to the conclusion that the active agents are bacteria. He found that while sterilized milk no longer can bring about the reduction, the properly can be restored by inoculating it with a trace of sour milk. He obtained cultures of a short, thick bacillus, which on inoculation into sterile milk quickly restores the reducing property. He believes that reductase and superoxydase are organized ferments and are products of bacterial growth; and that certain decomposition products of casein have similar power to decompose hydrogen peroxide. The oxydases are not products of bacterial growth. C. J. KONING (*Revue gén. de laiterie*, 1906, No. 8, p. 186) asserts that milk contains no oxydases, and that positive reactions with tincture of guaiacum are due to the presence of peroxide in the reagent, but peroxydases are always present, and diastases as well. The latter can be produced in sterile milk by inoculation with the common milk bacteria, and they are increased in the milk of pathological udders. He asserts that Schardinger's reaction is due to reductase, which may be produced by bacteria, and, like catalase, is increased by udder disease and by the presence of leukocytes.

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